

FLORA OF THE USSR

General editor: V. L. Komarov

VOLUME XXVI

COMPOSITAE

FLORA OF THE USSR

Volume XXVI

COMPOSITAE

Tribes Anthemideae, Senecioneae, and Calenduleae

FLORA OF THE USSR

Initiated under the supervision and chief editorship
of Academician V.L. Komarov

VOLUME XXVI COMPOSITAE

Tribes Anthemideae, Senecioneae, and Calenduleae

Volume Editors

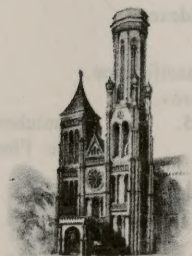
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SCIENTIFIC EDITOR'S PREFACE TO VOLUME XXVI

This is the second volume of the six (Vols. XXV–XXX) that treat the large family Compositae (Asteraceae). I have, as a practical matter, concentrated my editorial review of this volume on the discussions and the habitat and distribution statements. In this task, I have had the expert assistance of Ellen Unumb. We are confident of the general accuracy of the translation but also recognize that there will be imperfections.

Throughout this volume, as in the other volumes on this family, the translators have used the Latin term “capitulum” (pl., capitula), instead of the more familiar English term “head,” for the Russian term denoting the primary inflorescence of florets. “Head,” if it is used, describes a secondary inflorescence, i.e., an arrangement of capitula.

July 2000

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PREFACE

The twenty-sixth volume includes descriptions of 53 genera and 680 numbered species based on a critical examination of materials of four tribes of the family Compositae.

In this volume the vast majority of the species belong to the tribes Anthemideae and Senecioneae.

The work on the Anthemideae in particular required much time and effort because of the complexity of its classification. As a result, about 15 new genera were established, making it possible to define precisely many hitherto poorly delimited genera. In the process nearly 100 new species were described.

Considerable new information has also been added to the systematics of the genera belonging to the tribe Senecioneae.

About 80 so far unpublished taxa are included in this volume in Addenda XXV.

The species described in this volume include many economically important plants. Most important of these are the wormwoods, many species of which are major pasture plants in the southern zones of the Soviet Union or have medicinal or industrial importance.

While this volume was in press the latest volumes of the floras of Azerbaidzhan and Turkmenia were published, which contained material on these very genera. For technical reasons, not all the illustrations included in these Republic floras have been cited in the present volume.

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B.K. Schischkin	Genus <i>Senecio</i>
I.T. Vassilczenko	Genera <i>Calendula</i> , and <i>Gundelia</i>

Addenda XXV—Diagnoses plantarum novarum in tomo XXVI Florae
URSS commemoratarum.

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	17. <i>S. narynensis</i> (Winkl.) O. and B. Fedtsch.	...	822
	18. <i>L. karataviensis</i> (Lipsch.) Pojark.	...	824
	19. <i>L. schischkinii</i> Rubtz.	...	825

Subsection 2. *Racemiferae* Pojark.

	20. <i>L. jaluensis</i> Kom.	...	826
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Subsection 3. *Paniculatae* Pojark.

	21. <i>L. thyrsoides</i> (Ldb.) DC.	...	827
	22. <i>L. songarica</i> (Fisch.) Ling.	...	831
15030.	23. <i>L. knorringiana</i> Pojark.	...	832
	24. <i>L. thomsonii</i> (Clarke) Pojark.	...	834
	25. <i>L. altissima</i> Pojark.	...	835

Section 4. *Senecillis* (Gaertn.) Kitam.

Subsection 1. *Sericochaetae* Pojark.

XXIV	26. <i>L. macrophylla</i> (Ldb.) DC.	...	837
	27. <i>L. heterophylla</i> Rupr.	...	838
	28. <i>L. talassica</i> Pojark.	...	840
	29. <i>L. alpigena</i> Pojark.	...	841
	30. <i>L. altaica</i> DC.	...	843

Subsection 2. *Senecillis* (Gaertn.) Pojark.

	31. <i>L. glauca</i> (L.) O. Hoffm.	...	847
	32. <i>L. carpatica</i> (Schott, Nym. Kotschy) Pojark.	...	848

Subsection 3. *Stereochaetae* Pojark.

15040.	33. <i>L. mongolica</i> (Turcz.) DC.	...	849
	34. <i>L. schmidtii</i> (Maxim.) Makino	...	850

Section 5. *Glossophyllum* Pojark.

	35. <i>L. pavlovii</i> (Lipsch.) Cretz.	...	852
	36. <i>L. renifolia</i> (C.A.M.) DC.	...	853
	37. <i>L. caucasica</i> (MB.) G. Don.	...	855
	38. <i>L. correvoniana</i> (Alb.) Pojark.	...	856

Tribe. 9. *Calenduleae* Cass.

Genus 1565. *Calendula* L.

	1. <i>C. persica</i> C.A.M.	...	858
	2. <i>C. gracilis</i> DC.	...	859
	3. <i>C. arvensis</i> L.	...	859
	4. <i>C. karakalensis</i> Vass.	...	860
	* <i>C. officinalis</i> L. ...		860

Tribe 10. *Arctotideae* Cass.

Subtribe *Gundelinae* ("Gundelieae") Benth.

Genus 1566. *Gundelia* L.

15050.	1. <i>G. tournefortii</i> L.	...	862
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1 **Tribe 7. ANTHEMIDEAE** Cass. in Bull. Soc. Philom. Paris (1815) 173 and in Dict. Sc. Nat. II, Suppl. (1816) 73, XX (1821) 372, XXIX (1823) 176, L (1827) 497, LX (1830) 578; Benth. in Benth. and Hook. fil. Gen. Pl. II (1873) 203; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 267.—Ordo Elichryseae Link, Handb. I (1829) 712 pro min. p. and ordo Anthemideae Link, *ibid.* 752, pp.—Trib. Senecionideae subtrib. Chrysanthemeae and subtrib. Artemisieae Less. Synops. Com. (1832) 247, 257.—Trib. Helianthées sous-série Anthémidées Baill. Hist. des Plantes, VIII (1882) 71.—Fam. Anthemidaceae Bessey in Ann. Miss. Gard. 2 (1915) 164.—Capitula homogamous or heterogamous, with distinct ray and disk florets, or pseudoligulate ray florets absent. Receptacle with scales or hairy, less often glabrous. Anthers without or (rarely) with barely visible basal appendages. Style branches in bisexual florets usually truncate. Corolla mostly yellow, less often white or reddish; corolla of outer florets (ray florets) either similar to disk florets in color (capitula homochromous) or white, pink, purple and other shades (capitula heterochromous). Leaves almost always alternate, often incised.

Herbs, semishrubs, and shrubs, usually strongly fragrant. The largest number of genera of the tribe is found in South Africa (especially in the Cape Region) and in the Mediterranean Region. Moreover, Anthemideae is widely distributed throughout Europe and a large part of Asia; a few genera are represented in America, Australia, and New Zealand.

KEY TO GENERA OF TRIBE ANTHEMIDEAE*

1. Receptacle covered with scaly bracts 2.
- + Receptacle lacking scaly bracts, glabrous or hairy, very rarely bracts present in outermost florets of capitulum 9.
2. All florets in capitulum tubular; their corollas highly swollen in lower part and prolonged along both sides of ovary (and achene) as 2 long spurs appressed to and persisting with achene. Whitish-lanate plants of coastal sands of Abkhazia 1519. **Otanthus** Hoffmgg. and Link
- + Corolla basally lacking long spurs, not persisting with achene 3.
3. Capitula smaller, in terminal clusters on main stem and branches, in lax or dense corymbose inflorescence (solitary only in very weak specimens); peduncles always lacking true leaves, but often with

- small sulcating leaves involucre up to 8 mm, less often up to 10 mm in dia; limb of ligulate florets (if present) broadly ovate to almost semicircular 4.
- + Capitula larger, solitary terminal on main stem and leafy branches, but often numerous on plant; involucre (5)6–20(25) mm in dia; limb of ligulate florets (if present) broadly ovate to linear 5.
4. Capitula heterogamous; ray florets pistillate, almost always ligulate, very rarely tubular (but then also pistillate).....1516. **Achillea** L.*
- + Capitula homogamous; all florets tubular, bisexual. Soviet Central Asia 1517. **Handelia** Heimerl.
5. Capitula always without ligulate florets, homogamous, lamina linear and narrow-linear, pinnatisect or pinnatipartite into many, very short, obtuse or subobtuse lateral lobes, as if arranged in whorl on leaf axis. Ornamental plants sometimes escaping to the wild 1518. **Santolina** L.
- + Capitula usually heterogamous, with ligulate florets; very rarely with tubular florets only, but then leaves of different shape 6.
6. Achenes, at least in ray florets, highly compressed, dorsally with 2 almost winged, prominent lateral ribs 7.
- + Achenes of all florets with or without 3–5 slightly raised ribs 8.
7. Perennials; achenes lacking apical corona. Carpathians 1516. **Achillea** L. (*A. schurii* Sch. Bip.)
- + Annuals; achenes with a short apical corona or auricles 1515. **Anacyclus** L.
8. Achenes with 3 prominent ribs, lacking corona; base of corolla tube with somewhat developed outgrowths enclosing tip of ovary; receptacle hollow, obtusely conical. Medicinal and ornamental plants with strong aromatic smell sometimes escaping to the wild 1514. **Chamaemelum** Mill.
- 3 + Achenes with or without 4–5 prominent ribs; base of corolla tube lacking downward directed outgrowths; receptacle of different shapes 1513. **Anthemis** L.
9. Capitula smaller (up to 8–10 mm in dia), mostly drooping, lacking ligulate florets, on relatively short peduncles in corymbs or spikes, in turn, usually forming paniculate inflorescence; very rarely, in some arctic and Far Eastern species, few capitula borne in almost capitate inflorescence (and then pollen grains not spiny) 10.
- + Capitula, on the average, larger, with or without ligulate florets, in corymbs, less often in corymbose-panicles, or solitary terminal on stem and its leafy branches (in doubtful case, pollen grains always distinctly spiny) 14.

*Cf. also couplet 7.

10. Achenes with somewhat truncate corona, longitudinally lobed almost to base; pollen grains spinulose. Russian Central Asia 1537. **Lepidolopsis** Poljak.
+ Achenes lacking corona; pollen grains not spinulose 11.
11. Semishrubs with entire or partly 3(5)-fid leaves, sparsely stellate hairy; corolla also usually stellate hairy. Eastern Kazakhstan, Tien Shan 1549. **Kaschgaria** Poljak.*
+ Plants more or less pubescent or glabrous, but hairs always simple and bifurcated 12.
12. Ray florets fertile, pistillate or bisexual; others bisexual but sterile, compactly borne on narrow-conical receptacle; achenes strongly compressed dorsally, in single row, in rosette at base of receptacle. Annuals with pectinately pinnatisect leaves. Tien Shan, Tarbagatai 1532. **Neopallasia** Poljak.
+ Plants with characters otherwise 13.
13. Ray florets pistillate, fertile, with or without highly reduced corolla; disk florets bisexual, but sterile, staminate (with highly reduced pistils), with apically hairy corollas; achenes densely hispid; 45–70 cm high semishrubs. Sandy deserts of Soviet Central Asia 1551. **Mausolea** Bge.
+ Ray florets pistillate with highly reduced glabrous corolla, in axils of carinate involucre bracts; disk florets staminate, with rudimentary pistil and much longer, 5-toothed, apically hairy corolla; capitula small (1.0–2.5 mm in dia), often in somewhat globose clusters, in turn, borne in spicate inflorescences 1552. **Turaniphytum** Poljak.
4 ++ Disk florets fertile (with normally developed pistil) or sterile, but in former case achenes either smooth or involucre bracts not carinate 1550. **Artemisia** L.**
14. Annuals, rarely biennials with tap or fibrous roots, easily uprooted 15.
+ Perennials with well developed root system 25.
15. Receptacle less often hairy; capitula heterogamous, but only with tubular florets; outer florets pistillate, central bisexual. Altai, mountains of Soviet Central Asia 1550. **Artemisia** L. (*A. macrocephala* Jacq.)
+ Receptacle glabrous 16.
16. Capitula heterogamous; ray florets pistillate, with or without very small, indistinctly toothed corolla; disk florets bisexual, often fewer than ray florets, corolla 4-toothed. Far East 17.

* Cf. also couplet 38.

** Cf. also couplets 15 and 41.

- + Capitula homogamous (with only bisexual tubular disk florets) or heterogamous, with ligulate pistillate ray florets; corolla of disk florets 5-, less often (in species of *Matricaria* L.) 4-toothed 18.
- 17. Florets (except innermost) and achenes with persistent papillate processes of receptacle; corolla of disk florets with short obtuse teeth; achenes of ray florets highly compressed, with thick lateral ribs and dorsal papillate processes 1547. **Cotula** L.
- + Receptacle lacking papillate processes; corolla or disk florets deeply toothed; achenes of ray florets slightly compressed, 3–5-ribbed, glandular-hairy 1548. **Centipeda** Lour.
- 18. Achenes with 2–3-highly prominent longitudinal ribs, prismatic 19.
- + Achenes with 5–10 (rarely 4) not so prominent, often inconspicuous longitudinal ribs 20.
- 19. Ligulate florets white or absent; achenes more or less coronate, with 3 thick and obtuse ribs and 2 dark colored punctate glands in upper part of spine 1527. **Tripleurospermum** Sch. Bip.*
- + Ligulate florets yellow, of various shades; achenes without corona, with 2–3 almost winged sharp ribs. Ornamental plants sometimes escaping to the wild 1521. **Chrysanthemum** L.
- 5 20. Corolla of ligulate florets yellow or yellowish-white, limb 6–16 mm long; lamina entire, trilobate or 3-fid 21.
- + Corolla of ligulate florets white, or capitula with only tubular florets; leaves more or less pinnatisect 22.
- 21. Achenes with rather long auriculate corona; leaves entire. Crimea 1524. **Coleostephus** Cass.
- + Achenes lacking true corona, but with short obtuse teeth at apex; leaves trilobate or 3-fid. Baikal Region 1542. **Tridactylina** (DC.) Sch. Bip.
- 22. Achenes with or without inconspicuous corona, less often corona well-developed, but then corona of tubular florets four-toothed. Plants with strong aromatic smell 1525. **Matricaria** L.
- + Achenes with well developed, usually toothed or lobed corona; corolla of tubular florets always 5-toothed 23.
- 23. Achenes with highly truncate, more or less lobed corona, densely covered with whitish scaly hairs; capitula with ligulate, less often eligulate florets. Soviet Central Asia..... 1526. **Microcephala** Pobed.
- + Achenes entirely glabrous, with slightly truncate corona; large biennial or perennial plants 24.
- 24. Capitula solitary terminal on stem and leafy branches, lacking ligulate florets; leaves with relatively narrow (up to 1.5–2.0 mm wide);

*Cf. also couplet 29.

- terminal lobes. Kazakhstan 1536. **Cancrinia** Kar. and Kir. [*C. discoidea* (Ldb.) Poljak.]
- + Capitula usually with ligulate florets in corymb; leaves with broader terminal lobes; ornamental plants easily escaping to the wild 1528. **Pyrethrum** Zinn. [*P. parthenium* (L.) Sm.]
25. Ray florets of capitula ligulate; disk florets tubular 26.
- + All florets in capitula tubular 36.
26. Achenes with pappus of numerous (25–50) setaceous scales, usually longer than achenes. Alpine plants of Altai and Soviet Central Asia 1530. **Waldheimia** Kar. and Kir.
- + Achenes lacking pappus or pappus coronate, sometimes longitudinally lobed 27.
27. Achenes (and usually also receptacle) densely hairy all over, corona divided into oblong or ovate lobes right to base. Soviet Central Asia 1532. **Trichanthesis** Rgl. and Schmalh.*
- + Achenes entirely glabrous 28.
- 6 28. Achenes with 2–3-highly prominent ribs, prismatic.....29.
- + Achenes with 5–10 often scarcely visible ribs more or less terete ... 30.
29. Semishrubs; achenes with somewhat winged ribs. Ornamental plants 1520. **Argyranthemum** Webb. ex Sch. Bip.
- + Herbs; achenes with 3 somewhat thick ribs and usually 2 dark colored punctate glands in upper part of spine 1527. **Tripleurospermum** Sch. Bip.**
30. Achenes lacking corona, with 5 inconspicuous veins 31.
- + Achenes with distinct corona, if lacking, then with (8)10(12) quite prominent rib-like veins 32.
31. Semishrubs; involucre cupulate or narrow cupulate, 4–7 mm in dia and 4–6 mm long; ligulate florets 1–10 (entirely absent in some capitula), with broadly ovate or oblong 1.2–8.0 mm long limb. 1543. **Brachanthemum** DC.
- + Herbs, rarely semishrubs, involucre patellate or broadly cup-shaped, (6)8–20(40) mm in dia and 4–10(15) mm long; ligulate florets 10–30 (or more) with oblong or, linear, 8–30(60) mm long limb. .. 1541. **Dendranthema** (DC.) Des Moul.
32. Ligulate florets yellow 1538. **Tanacetum** L.***
- + Ligulate florets white, less often pink or of various other shades ... 33.

* Cf. also couplet 48.

** Cf. also couplet 19.

*** Cf. also couplet 42.

33. Corona of achenes 1.5–2.4 mm long, auriculate; corolla of ligulate florets fused with ovary; stems highly woody at base. Mountains of Soviet Central Asia 1529. **Spathiapappus** Tzvel.
 + Corona of achenes not auriculate, often lacking; corolla of ligulate florets not fused with ovary 34.
34. Achenes with well developed, but sometimes very short corona, 5–8 (rarely up to 12)-veined; lamina usually divided variously, rarely entire 1528. **Pyrethrum** Zinn.*
 + Achenes of tubular florets lacking true corona, but often with veins apically projecting as obtuse teeth; veins (8)10(12), prominent, forming ribs; leaves usually entire, toothed or slightly lobed, less often 3–5-fid, with linear, entire lateral lobes 35.
35. Ligulate florets sterile; lower leaves falling early. Marsh plants
 1523. **Leucanthemella** Tzvel.
- 7 + Ligulate florets fertile; lower leaves long persisting. Meadow plants
 1522. **Leucanthemum** Mill.
36. Achenes lacking corona, but sometimes with obtuse upper margin slightly raised on one side 37.
 + Achenes with usually well developed corona, sometimes very short, but always with sharp and somewhat toothed or lobed margin ... 42.
37. Plants entirely glabrous; capitula heterogamous, with one row of 1–10 fertile pistillate ray florets and numerous bisexual, but usually sterile disk florets, densely clustered because of sticky resinous secretions; achenes globose-obovoid, highly compressed dorsally. Siberia, Far East 1546. **Filifolium** Kitam.
 + Plants more or less hairy; disk florets fertile, free; achenes more or less terete 38.
38. Semishrubs with entire or 3(5)-fid leaves, sparsely stellate hairy; usually corolla also stellate hairy 1549. **Kaschgaria** Poljak.**
 + Pubescence dense; hairs simple and bifurcate; corolla glabrous or with simple hairs 39.
39. Achenes arcuately bent, narrow-cylindrical (6–8 times as long as wide), rather densely covered with short glandular hairs; biennial or perennial monocarpic plants. Soviet Central Asia
 1540. **Pseudohandelia** Tzvel.
 + Achenes broader, entirely glabrous; perennial polycarpic plants ...
 40.
40. Herbs, always with highly reduced nonflowering shoots (forming rosettes of basal leaves); stems usually with only few reduced leaves; capitula homogamous (with only bisexual tubular florets). Soviet Central Asia 1545. **Hippolytia** Poljak.

* Cf. also couplets 24 and 23.

** Cf. also couplet 11.

- + Semishrubs or herbs, with densely leafy stems, usually lacking reduced nonflowering shoots; capitula heterogamous (ray florets pistillate), rarely some homogamous (then lamina entire) 41.
- 41. Capitula in lax corymbose-panicles, few-flowered (less than 20 florets); corolla of disk florets hirsute along teeth. Caucasus 1550. **Artemisia** L. (*A. fasciculata* M.B.)
- + Capitula in dense or lax corymbose inflorescence, rarely solitary, usually with more than 20 florets; corolla glabrous. Soviet Central Asia 1544. **Ajanía** Poljak.
- 8 42. Capitula heterogamous; ray florets (sometimes few!) pistillate, often ligulate; disk florets bisexual 1538. **Tanacetum** L.*
- + Capitula homogamous; all florets bisexual 43.
- 43. All leaves entire, oblong or ovate, small-toothed; capitula numerous; in dense corymbs; stems 30–120 cm high; aromatic garden plants often escaping to the wild 1528. **Pyrethrum** Zinn. [*P. majus* (Desf.) Tzvel.]
- + Leaves pinnatisect or pinnatipartite 44.
- 44. Involucral bracts fewer and wide, almost equal in length; achenes smooth, with (8)10(12) very prominent veins forming ribs; dwarf, almost stemless semishrubs, caespitose, with capitula on long scapes. Chu-Ili Mountains 1535. **Cancriniella** Tzvel.
- + Outer involucral bracts a third to two-thirds as long as inner ones; plants of different habit 45.
- 45. Capitula on very short (up to 6 mm long), arcuate peduncles; pappus of achenes as pappiform corona of 10–20 narrow-linear scales, longer than achene; dwarf, prostrate, semishrubs. Western Tien Shan 1531. **Ugamia** Pavl.
- + Capitula on longer, always erect peduncles; corona of achenes structurally different 46.
- 46. Perennial herbs 47.
- + Semishrubs or semishrubs with somewhat woody stems near base. Mountains of Soviet Central Asia 48.
- 47. Achenes with entire auriculate corona; capitula in dense terminal corymbs. Transcaucasia 1539. **Hemipappus** C. Koch
- + Achenes with corona more or less uniformly bordering their tip, entire or lobed; capitula in lax corymbose-paniculate inflorescence, less often in somewhat dense corymbs or solitary. Soviet Central Asia 1536. **Cancrinia** Kar. and Kir.**
- 48. Ovary and achenes (and often also receptacle) densely hairy 1532. **Trichanthesis** Rgl. and Schmalh.***

* Cf. also couplet 32.

** Cf. also couplet 24.

*** Cf. also couplet 27.

- + Ovary and achenes glabrous 49.
- 49. Leaves 3-fid or entire; corona of achenes mostly uniformly bordering their tip, usually divided to base into oblong scales; semishrubs 1534. **Lepidolopha** Winkl.
- 9 + Leaves (except uppermost) pinnatisect, with 2–5-lateral lobes; corona of achenes entire or lobed, but always obliquely truncate either completely or almost to base; semishrubs 1533. **Xylanthemum** Tzvel.

Subtribe 1. **ANTHEMIDINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 268.—Tribe Senecionideae Less. subtrib. VI. Chrysanthemeae Less. 1. Anthemideae Less. Synops. Comp. (1832) 247 and subtrib. VII. Artemisieae Less. 1. Santolineae Less. ibid 258.—Receptacle with scales.

GENUS 1513. **Anthemis**^{1,2}

L. Sp. pl. II (1753) 893; Hoffm. in Pflanzenfam. IV, 5 (1894) 271 p. p.—*Maruta* Cass. in Dict. Sc. Nat. XXIX (1823) 174.—*Cota* J. Gay ex Guss. Fl. Sic. Syn. II (1842–1844) 866.

Capitula many-flowered, with distinctly developed ray (ligulate) florets or with only disk florets; ray (ligulate) florets 1-rowed, almost always pistillate, other florets staminate-pistillate (amphisporangiate), 5-toothed, usually with compressed tube, sometimes basally swollen. Involucre imbricate; bracts sometimes scarious or fimbriate.

Receptacle covered with scales. Achenes cylindrical-obconical, obpyramidal and angular, sometimes tetraquetrous, more or less longitudinally striate-ribbed, with corona of small teeth or with long, auriculate, lateral processes, or almost entirely lacking corona, sometimes distinctly compressed. Annual or perennial herbs, sometimes semishrubs.

Lectotype of genus: *A. arvensis* L.

Until recently it was believed that the genus *Anthemis* was comprised of 130 species [A. Rendle. *The Classification of Flowering Plants*, II (1938), London], which are mainly distributed in West Asia and Europe. But this number may increase significantly if the limits of species in this genus are understood in the sense of concrete geographic races (much splitting of polymorphic species such as *A. tinctoria*

¹Treatment by An. A. Fedorov.

²Ancient Greek name used by Linnaeus to designate the species resembling *A. arvensis*. The word "*Anthemis*" is derived from "*anthos*," i.e., flower.

L. s. 1., *A. rigescens* Willd. s. 1., *A. montana* L. s. 1., etc., is possible). Moreover, new species continue to be described even now also from other groups of the genus. Therefore, the provisional number of *Anthemis* species may be put at close to 150. In the USSR 51 species of this genus are found.

- 10 The majority of species of this genus is concentrated in the region of West Asia and the Caucasus and partly in the Mediterranean Region. In Europe, a few species are distributed in the north, only as far as Scandinavia; only one species is found in Siberia, reaching approximately as far as Krasnoyarsk. Members of the genus *Anthemis* are absent in the Arctic and the tropics. Ecologically, most of the species are montane, subalpine, partly alpine or rock and semidesert, partly steppe, rarely forest, as well as desert and weedy plants.

There is no comprehensive monograph of the genus. Therefore, the publications of Boissier, especially *Diagnoses* and *Flora Orientalis* and a series of papers of D.I. Sosnovsky on *Anthemis* (cf. literature cited under different species) are of great importance in understanding the species found in the Caucasus and Western Asia. Numerous *Anthemis* species were described mainly from Asia Minor by the German Botanist Karl Koch. However, now that the type (authentic) specimens of Koch's species preserved in Berlin have been permanently lost, the species established by him and attempts to understand them are, in a real sense, the "*crux et scandalum botanicorum*."

At present, even with the joint efforts of Soviet botanists to establish not "aggregate" species but specific geographic races, no identification of Koch's species, described carelessly and unintelligibly, with the species described by other authors—an approach followed, for example, by Boissier (l. c.)—can help in understanding Koch's types. Hence, we are surprised at the boldness shown by D.I. Sosnovsky and A.A. Grossheim (cf. literature citations), who confidently reported as a matter of fact the quite unresolved species, *Anthemis platyglossa* C. Koch, *A. brachyglossa* C. Koch, and others in the composition of the "Flora of the Caucasus." A botanist using the "Flora of the USSR" can clearly see from our notes made in the diagnoses of the different species how confusion has occurred in the names and nomenclatural identities. Therefore, we have listed certain, especially obscure species of Koch only in the notes as doubtful species, since hope for strict scientific clarification of them is essentially lost forever.

Of the two lectotype species proposed for the genus *Anthemis*, *A. arvensis* L. should be preferred over *A. maritima* L. Although the lectotype *A. arvensis* was proposed by A.S. Hitchcock and M.L. Green only in 1929 and again by E.P. Phillips in 1951, whereas *A. maritima* was proposed as a lectotype in 1913 by N.L. Britton and A. Brown,

- still *A. arvensis* is more appropriate as the type species of the genus *Anthemis* L., because it usually has been included in the long established type section, which until recently was called *Euanthemis* (now *Anthemis* in accordance with the currently operative nomenclatural rules). The second lectotype, i.e., *A. maritima*, in our classification, cannot in any way be included under this section. Besides, an examination of *A.*
- 11 *arvensis* convincingly shows that this species actually (even in habit) includes all the typical characters of the genus. However, as often happens in similar cases, the species considered by us as the lectotype of course cannot be considered as the prototype of the genus in the true genetic sense and is not the oldest (nor the most primitive) species. In this respect, attention should be paid to other sections of the genus, partly to section *Cota* and especially to section *Rumata*, which not only include perennial herbs but also semishrubs, and species of a clearly relict nature. In this sense, species like *A. fruticulosa* MB., *A. trotskiana* Claus ex Bge. (from section *Rumata*) and forest species of the Caucasus Mountains *A. zyghia* Woron., *A. marisenigri* Fed., *A. woronowii* Sosn. (section *Cota*), and others should be recognized as the most typical (oldest) species of the genus *Anthemis*.

Anthemis species are of interest as ornamental plants. Particularly valuable in this context are the Caucasian species, for example, *A. marschalliana* MB., *A. sosnovskyana* Fed., *A. macroglossa* Somm. and Lev., *A. saportana* Alb., *A. iberica* MB., and *A. zyghia* Woron.

1. Achenes distinctly compressed; receptacular scales carinate 18.
- + Achenes not compressed, roundish or angular in cross section; receptacular scales without distinct keel 2.
2. Semishrubs or perennial herbs, with rhizome or many-headed hard and woody root; stem simple or with few branches, arising from short caudices, also bearing quite frequently nonflowering shoots with lax rosettes of leaves; leaves pinnatipartite or pinnatisect, sometimes pinnatilobate, usually crowded in lower part of stem 4.
- + Biennials or annuals, with pinnate leaves, lacking basal rosettes and caudices 3.
3. Achenes angular (usually tetraquetrous); receptacular scales oblong-lanceolate 43.
- + Achenes terete; receptacular scales narrow-lanceolate 47.
4. Peripheral (ligulate) florets golden-yellow 5.
- + Peripheral (ligulate) florets white 6.
5. Leaves green, subglabrous or mildly pubescent; involucre bracts with blackish-brown border 15. *A. sosnovskyana* Fed.
- + Leaves silvery-gray, sericeous; involucre bracts lacking distinct blackish-brown border 14. *A. marschalliana* Willd.

6. Involucral bracts with wide dark brown or blackish fimbriate border 7.
- + Involucral bracts pale, sometimes with very narrow dark stripe along margin or with brownish midrib; inner bracts usually broadly scarious at apex and sometimes fimbriate 11.
- 12 7. Leaves densely pubescent, scarious-lanate, with approximate lobes of segments; involucral bracts dark brown along margin; stems short, usually 10(15) cm high 5. **A. ptarmiciformis** C. Koch
- + Plants sparsely pubescent or subglabrous 8.
8. Achenes finely punctate; plants caespitose; stems with many branches, nonflowering shoots bearing rosettes of leaves; capitula rather large, up to 4.0–4.5 cm in dia; stems usually numerous 4. **A. carpatica** Waldst. and Kit. ex Willd.
- + Achenes not distinctly punctate; plants not caespitose 9.
9. Leaves glabrous, pinnatilobate or pinnatipartite into somewhat broad obtuse lobes; corona of achenes short, crenate-lobate 1. **A. saportana** Alb.
- + Leaves pinnatipartite, more or less pubescent; leaf lobes linear... 10.
10. Limb (ligule) of peripheral florets abruptly narrowed toward base; leaf lobes approximate; involucral bracts obtuse, with roundish apex 3. **A. anahytae** Woron.
- + Limb (ligule) of peripheral florets basally carinate; leaf lobes somewhat remote; involucral bracts acuminate 2. **A. iberica** MB.
11. Semishrubs, with many woody but fragile (easily breaking) caudices and nonflowering shoots with rosettes of leaves in lower part; hairs usually dense, often white-tomentose; stems sparingly branched or simple; capitula large, about 2.0–2.5 cm in dia; involucre pale, white-pubescent 12.
- + Perennial herbs; hairs not white-tomentose 14.
12. Stems simple, short, usually 10–15 cm high; caudices somewhat spreading at base, thick; leaves densely white-pubescent 11. **A. fruticulosa** MB.
- + Stems branched; usually 15–30 cm high, sometimes reduced; plants herbaceous in upper part; pubescence gray or white, but usually not very dense 13.
13. Receptacular scales abruptly acuminate; caudices short, somewhat thick, very fragile, numerous 12. **A. trotzkiana** Claus ex Bge.
- + Receptacular scales 3-toothed at apex; caudices long, slender, few; stems slender, with long slender branches 13. **A. calcarea** Sosn.
14. Lobes of leaf segments very small, about 2 mm long, approximate; stems very slender, leafless over large part 15.
- 13

- + Lobes of leaf segments oblong, sometimes divergent and divaricate, 3–5 mm long; stems strong, erect till flowering 16.
- 15. Achenes sulcate-ribbed, tuberculate 6. **A. anatolica** Boiss.
- + Achenes almost tetraquetrous, tuberculate 7. **A. emiliae** Sosn.
- 16. Stems with reddish longitudinal stripes; leaves pinnate, with few broad lobes 10. **A. tempskyana** Freyn and Sint.
- + Stems without red stripes; leaves bipinnatisect into narrow lobes... 17.
- 17. Plants short, 10(15) cm high; disk about 0.7 cm in dia 8. **A. sterilis** Stev.
- + Plants tall, 30–40 cm high; disk 1.0–1.5 cm in dia 9. **A. tranzscheliana** Fed.
- 18. Perennial, with thick and strong woody root 22.
- + Annuals 19.
- 19. Lobes of leaf segments distinct, somewhat broad, crenate and sharply dentate; stems and their branches sinuate 46. **A. wiedemanniana** Fisch. and Mey.
- + Lobes of leaf segments approximate, narrowly linear, with oblong teeth; stems erect, with straight, divaricate branches 20.
- 20. Inflorescence peduncle thick, clavate 44. **A. coelopoda** Boiss.
- + Inflorescence peduncle almost not clavate 21.
- 21. Lobes of leaf segments pinnatipartite, roundish at apex 45. **A. austriaca** Jacq.
- + Lobes of leaf segments pinnatisect, somewhat acute 43. **A. altissima** L.
- 22. Limbs of peripheral florets (ligule) yellow 23.
- + Limbs of peripheral florets (ligule) white 31.
- 23. Stems always simple, about 20–30 cm long, less often more, with single capitulum; leaves crowded in lower part of stem, pubescent but greenish, with small, approximate lobes 26. **A. monantha** Willd.
- + Stems, as a rule, branched and usually high, generally taller than 30 cm, leafy up to middle and above 24.
- 24. Stems branched above; inflorescence peduncles distinctly clavate 24. **A. saguramica** Sosn.
- + Stems branched from middle or base, or even simple; inflorescence peduncle not clavate 25.
- 14 25. Plants 30–50(70) cm high; stem erect or basally arcuate, but never spreading or bend downward 26.
- + Plants shorter, 15–20(30) cm high stem somewhat spreading 29.
- 26. Limb of peripheral florets (ligule) short, a half of disk, truncate; capitula 2 cm in dia 23. **A. maris-nigri** Fed.

- + Limb of peripheral florets (ligule) equalling or exceeding disk 27.
- 27. Plants densely lanate-hairy; leaves large, up to 4 cm long, with broad lobes; stem densely leafy up to middle 25. **A. markhotensis** Fed.
- + Plants sparsely and finely pubescent or almost glabrous 28.
- 28. Plants grayish; involucre hairy; segments of leaves narrow-linear, with sharp and pointed teeth; limb of peripheral florets (ligule) light yellow 22. **A. subtinctoria** Dobroc.
- + Plants green, almost glabrous; involucre subglabrous; segments of leaves linear, somewhat broad; stem reddish; limb of peripheral florets (ligules) bright or deep yellow 21. **A. tinctoria** L.
- 29. Involucral bracts with prominent, bright green midrib; leaves highly reduced, 1.0–1.5 cm long 30.
- + Involucral bracts with brownish midrib; leaves oblong, up to 3 cm long, gray, densely borne in middle of stem; leaf segments narrow-linear, slightly grayish 29. **A. zephyrovii** Dobroc.
- 30. Stems usually with single capitulum; leaves small, about 1 cm long, densely borne and crowded in lower half of stem, greenish 28. **A. debilis** Fed.
- + Stems branched, with many capitula; leaves as long as in previous species, covering stem up to two-thirds, grayish from pubescence ... 27. **A. cretacea** Zefir.
- 31. Plants with long, creeping stem and branches, subglabrous; stem branched above; leaves reduced, with toothed segments 37. **A. euxina** Boiss.
- + Plants with erect stem 32.
- 32. Leaves densely velutinous-tomentose, silvery, with broad and approximate segments, broadly obovate; involucral bracts with brownish-black border 41. **A. zyghia** Woron.
- + Leaves glabrous or pubescent, but never velutinous 33.
- 33. Involucral bracts with dark brown or black border 34.
- + Involucral bracts pale, whitish, or greenish 37.
- 15 34. Leaf segments broad, reduced, approximate, obtuse, truncate-toothed; plants bright green, somewhat pubescent; capitula not more than 3–4 cm in dia 40. **A. abagensis** Fed.
- + Leaf segments narrow, oblong, sometimes leaves thrice-pinnate, with very small lobes; capitula large, 4–5 cm in dia 35.
- 35. Leaves finely divided, sometimes thrice-pinnate; lobes small 39. **A. schischkiniana** Fed.
- + Leaves divided into narrow or somewhat broad segments lacking small pinnate lobes, truncate-toothed 36.

36. Leaf segments oblong-linear; involucre bracts somewhat obtuse, broadly scarious-fimbriate and blackish-brown along margin 38. **A. macroglossa** Somm. and Lev.
- + Leaf segments and lobes narrow-linear, acuminate, grayish; involucre bracts sharply oblanceolate or pointed deltoid, with distinct and narrow blackish-brown border 42. **A. melanoloma** Trautv.
37. Leaves grayish or dark gray from sparse or dense pubescence 38.
- + Leaves green, subglabrous or sparsely pubescent 42.
38. Plants densely tomentose; leaf surface entirely covered with tomentum, gray; internodes of young branches white-pubescent ... 36. **A. talyschensis** Fed.
- + Plants grayish but not densely tomentose; leaf surface always clearly visible 39.
39. Capitula large, up to 4–5 cm in dia; disk up to 1.5–2.0 cm in dia 31. **A. jailensis** Zafir.
- + Capitula up to 3–4 cm in dia; disk up to 1 cm in dia 40.
40. Stems numerous, usually highly branched; inner involucre bracts with rusty fimbria at apex 34. **A. dubia** Stev.
- + Stems few or solitary, slightly branched, rarely simple; involucre bracts with or without deep brown fimbria at apex 41.
41. Leaves minute, 1.0–1.5 mm long, reduced, with approximate lobes, orbicular, crenate-pinnate 35. **A. woronowii** Sosn.
- + Leaves large, up to 3 cm long, oblong, with divergent segments and lobes; segments unequal, lobes acuminate 32. **A. dumetorum** Sosn.
42. Leaf segments very narrow, long, lanceolate-linear, acute, along margins incised and sharply toothed; leaves vertical; capitula 2.5–3.0 cm in dia 33. **A. linczevskyi** Fed.
- + Leaf segments linear-oblong, somewhat broad; capitula large, about 4.0–4.5 cm in dia 30. **A. rigescens** Willd.
43. Plants small, 10–15 cm high, silvery-sericeous with slender stems and their branches divaricate from base 45.
- + Plants 20–30(40) cm high, appressed and grayish-pubescent or villous; stems branched but erect 44.
44. Plants lanate-tomentose-villous 17. **A. ruthenica** MB.
- + Plants appressed-pubescent, grayish 16. **A. arvensis** L.
45. Corolla tube of disk florets swollen below 18. **A. candidissima** Willd.
- + Corolla tube of other shape 46.
46. Corolla tube straight 19. **A. grossheimii** Sosn.

- + Corolla tube with constriction in middle, resembling sand clock in shape 20. **A. hirtella** Winkl.
- 47. Leaves twice pinnate, lobes numerous, small, linear; plants usually 15–20 cm high 48.
- + Leaves pinnate, with small number of segments and lobes; plants small, 5–10(15) cm high 49.
- 48. Lobes of leaf segments reduced, narrow-linear.....47. **A. cotula** L.
- + Lobes of leaf segments oblong, filiform 48. **A. lithuanica** (DC.) Trautv.
- 49. Leaves usually linear, often entire, lacking segments or with few lateral lobes 51. **A. deserticola** Krasch. and M. Pop.
- + Leaves pinnate 50.
- 50. Plants pubescent; lobes of leaves reduced, narrow-linear 49. **A. odontostephana** Boiss.
- + Plants almost entirely glabrous; lobes of leaves long, narrow-linear 50. **A. microcephala** (Schrenk) B. Fedtsch.

Section 1. Rumata Fed. sect. nova in Addenda, XXV, 865.—*Euanthemis* DC. Prodr. VI (1837) 7 pp.—Sect. *Chamaemelum* Cass. in Dict. Sc. Nat. XXIX (1823) 279 pp.—Sect. *Euanthemis* ser. *Perennes* Boiss. Fl. or. III (1875) 278.—Ser. *Sphacelatae* Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927) 173.—Achenes angular in cross section, obconical or obpyramidal, not compressed. Receptacle concave or hemispherical. Receptacular scales more or less carinate and usually acute. Involucre bracts with blackish border or pale, usually with wide scarious margin. Perennial herbs or semishrubs, with somewhat hard rhizome or woody root and simple or slightly branched stems, each bearing single capitulum. Leaves lobate or pinnate, crowded in lower part of stem forming loose rosette.

17 Type of section: *A. saportana* Alb.

In section *Rumata*, we have included the montane perennial (rhizomatous) and partly semishrub species of the genus *Anthemis*, characterized by broad scariously bordered and fimbriate involucre bracts, frequent caudices and nonflowering shoots bearing leaf rosettes. In the true (genetic) sense, the species of this section are the most ancient, but the initial nomenclatural type of the genus, *Anthemis arvensis* L., is included in type section *Anthemis*, which is phylogenetically definitely more advanced than section *Rumata*.

Series 1. Saportanae Fed.—Involucre bracts with dark brown or blackish, broad, scarious-fimbriate border. Leaves pinnately lobed, pinnately parted or pinnately divided into numerous segments and lobes. Capitula large, up to 3–4 cm in dia; limb of peripheral florets (ligule) white. Plants exclusively alpine.

1. *A. saportana* Alb. in Bull. Herb. Boiss. III (1895) 92; ej. Prodr. Fl. Colch. 135; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3, 173; Grossh. Fl. Kavk. IV, 120; Sosn. in Fl. Gruzii, VIII, 314; Kolak. Fl. Abkhaz. IV, 226.

Perennial. Whole plant covered with inconspicuous, sometimes somewhat tomentose or appressed, very small hairs, sometimes almost glabrous, short, usually about 10–15(20) cm high; stock (caudex) highly branched, somewhat woody, brown, covered with scaly remnants of dried leaves, besides nonflowering shoots terminating into leaf rosette; stems basally slightly arcuate, leaf only below, with single capitulum and few longitudinal stripes, not clavate below capitulum; rosulate leaves and subtending leaves pinnately lobed or almost palmately lobed, or pinnately parted, sometimes with few lobes, ovate-cuneate, narrowed into petiole; segments (or lobes) broad lanceolate, obtuse, sometimes with 2–3 terminal teeth; cauline leaves short-petiolate, cuneate-oblong, divided into few broadly linear or linear-deltoid, obtuse or acute lobes with minute cusps, sometimes bidentate, approximate or slightly divergent; upper leaves narrower, less incised or almost entire. Capitula rather large, about 4 cm in dia. Bracts of sparsely white-pubescent involucre with blackish border; outer bracts deltoid-lanceolate; inner bracts ovate-lanceolate, with wide scarious margin, slightly incised, not acuminate. Receptacular scales linear-lobate, blackish-tipped, 18 divided, acute. Ligules white, oblong-elliptical or elliptical, as long as disk. Achenes longitudinally sulcate, basally extended; corona a fifth as long as achene, crenate. Flowering June to August. (Plate I, Fig. 1).

In alpine zone, on rocks, predominantly limestone screes, as well as in meadows, near thawing snow.—*Caucasus*: Western Transcaucasia (particularly in mountains of the Bzyb River basin and in region of the Caucasian Reserve). Endemic. Described from Abkhazia ("along high rocks of the Adzituko Range"). Type in Leningrad; isotype in Geneva.

Note. The distribution of *A. saportana* is confined to the western part of the Main Caucasus Range, mostly to the limestone ranges (Abkhazia, region of the Caucasian Reserve). In the east, the range of this species does not even reach Elbrus, and beyond that another race—*A. iberica* MB.—predominates. In turn, in the Lesser Caucasus, the latter species is replaced by a separate race—*A. anahyae* Woron. In Asia Minor, beginning from Ararat, other species of the series *Saportanae* are found. *A. carpatica*, found in the mountains of Central, Eastern and Southern Europe beginning at the Eastern Carpathians, is the far western species of this series.

2. **A. iberica** MB. Fl. taur.-cauc. II (1808) 328; ej. ibid. III, 580; DC. Prodr. VI, 7; Spreng. Syst. veget. III, 593; Ldb. Fl. Ross. II, 2, 522, excl. syn. nonnull.; Boiss. Fl. or. III, 289; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927) 173.—*A. iberica* var. *elata* and var. *tomentosa* Sosn. ex Grossh. Fl. Kavk. IV (1934) 121; Sosn. in Fl. Gruz. VIII, 315.—*A. iberica* var. *minor* Boiss. l. c. quoad pl. e Cauc.-orient.—*A. montana* Georgi, Besch. d. Russ. Reichs. III, 1254, nom.—*A. caucasica* C.A.M. Verzeichn. (1830) 75, non Adam (1805), nec Hernem. et al.—*A. nivalis* Adam ex Tausch. in Ldb. op. cit. 523, pro syn.—*A. alpina* var. β . Willd. Sp. pl. III (1804) 2178, non *A. alpina* L.—*Pyrethrum ptarmicifolium* Willd. ex Ldb. op. cit. 523, pro syn.—*P. nivale* Ad. ex Ldb. l. c. pro syn.; Boiss. l. c. pro syn.

Perennial, with multicauline habit, 10–15(20) cm high, with woody root producing numerous, branched, reduced brown caudices, covered with remnants of dried petioles; nonflowering shoots bearing leaf rosettes. Stems ascending from arcuate base, erect above, 15–20(30) cm high, unbranched, uncapitulate, longitudinally striate, glabrous above, mildly pubescent below. Leaves (up to middle cauline leaves) petiolate, mildly appressed-hairy, pinnate, with linear, three-parted, less often 5-parted, sometimes even entire and rather narrow segments; lobes also narrow, acute and short or long, linear. Capitula large, about 4–5 cm in dia, with white ray (ligulate) florets; ligule oblong-lanceolate, 3-toothed. Involucral bracts scarious along margin and apex, lanate-tomentose, acuminate with brownish-black border. Receptacular scales lanceolate, scarious at apex, somewhat cuspidate. Achenes apically along margin with denticles of indistinct corona. Flowering June to August. (Plate I, Fig. 2).

In alpine zone on stony places.—*Caucasus*: Ciscaucasia, Dagestan, Eastern Transcaucasia (north); Western Transcaucasia (eastern part). Endemic. Described from Georgia. Type in Leningrad.

3. **A. anahyae** Woron. ex Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927), absque diagn. lat., nec ross., sed tantum cum observ. brevibus de florum forma Descr. nostra in Addenda, XXV, 865; Grossh. Fl. Kavk. IV, 120, diagn. brev. ross. in clave; An. Fed. in Sov. Bot., XIII, 4, 18, nom.

Perennial. Subglabrous or sparsely pubescent plants; rhizome woody, brown, producing reduced caudices and nonflowering shoots bearing leaf rosettes. Stems rather short, 10–15(20) cm high, ascending or erect, mostly leafy at base. Lower cauline leaves and leaves of nonflowering shoots obovate or lobate, more or less long-petiolate (other leaves sessile), pinnate; leaf segments oblong-lanceolate or linear, entire or lobed, the latter entire or 3-toothed at apex; rachis somewhat

broad, lacking teeth; upper cauline leaves reduced, finely lobed or entire. Capitula rather large, about 4–5 cm in dia. Outer bracts of more or less hairy involucre deltoid; inner bracts oblong or oblong-obovate; all bracts broadly scarious and dark brown or blackish on margin, with gradually increasing membranous roundish apex from outer to inner bracts. Ligules white, oblong-elliptical, indistinctly 3-toothed at apex, narrowed toward lower side. Achenes as in *A. iberica*. Flowering June to August.

In alpine zone on rocks and screes.—*Caucasus*: Southern Transcaucasia. *General distribution*: Balkans-Asia Minor (east). Woronow collected as the holotype a specimen from Azerbaidzhan (Murov-Dag Range, Gyamysh Mountain). This specimen and also the isotype are preserved in Leningrad.

Note. The specific epithet is derived from the Armenian feminine name Anait. Unfortunately, it is impossible now to determine whom J.N. Woronow had in mind when naming this species. The spelling of the specific epithet varies on the labels written in Woronow's hand: instead of the transcription "*Anahytae*" published by Sosnowsky (l. c.) and Grossheim (l. c.), Woronow wrote "*Anahitae*." However, the first version, which had already put into print, must be recognized as the valid variant.

Specimens are preserved in Leningrad from Surbkhach Mountain in Asia Minor, some of which were identified earlier as *A. ptarmiciformis* C. Koch, that should be included in *A. anahytae*. There is also no doubt that all specimens from Alagyoz in Armenia should also be included under this species. Thus, *A. anahytae*, growing in the mountains of the Lesser Caucasus, is distributed beyond the limits of this region and, therefore, is not endemic to the Caucasus.

4. *A. carpatica* Waldst. and Kit. ex Willd. Sp. Pl. III (1800) 2179; Simonkai, Enum. Fl. Transs. (1886) 316; Boiss. Fl. or. III, 290, pro max. p.; M. Popov, Rast. i Fl. Karpat (1949) 247; Katina in Vzn. Rosl. URSS (1950) 536; Dostal, Klič k úplné květeně CSR (1954) 846.—*A. montana* Bielz apud Schur in Verh. Seibenb. Ver. Naturw. I (1850) 104, nom. L.—*A. kitaibelii* DC. Prodr. VI (1837) 7, non Spreng.—*A. petraea* Tenore, Fl. Napol. I (1811–1815) 1; ibid. II (1820) 246.—*A. stiriaca* Vest in Syll. Ratisb. I (1824) 12.—**lc.**: Tenore, op. cit. II, t. 82; Dostal, op. cit. p. 846, f. 23600 (mediocr.).—**Exs.**: L. Vagner, Fl. der Marmaros, sine numero (e loco classico, ex mont. Pop-Ivan): F. Schultz, Herbar. normale, nov. ser. Cent. 23, No. 2205 (e loco classico); Fl. Exs. Reipubl. Bohem. Sloven. No. 1274 (e loco classico) Fl. Exs. Austro-Hungar. No. 1002 (e loco class. Anthemidis stiriaceae, ex mont. "Jurgbaueralpe"); Domin and Krajina, Fl. Cechoslov,

exs. No. 400; Dörfler, Herb. normale, No. 4114 (sub *Anthemide petraea*, e loco classico, ex mont. "La Majella"); Fiori and Béguinot, Fl. Ital. Exs. ser. II, No. 1577 (sub *Anthemide petraea*, e loco classico speciei).

Perennial. Glabrous or weakly appressed-hairy caespitose plants, about 10–15 cm high, bearing numerous caudices densely covered with brown scaly remnants of old leaves; non-flowering shoots bearing leaf rosettes, or usually numerous unicapitulate stems and not leafless all along except lower densely leafy part. Lower cauline and rosulate leaves rather long-petiolate; lamina cuneate-ovate, pinnately cut into few broadly linear or narrow, entire, 3-fid or 3-lobed, somewhat acute segments; cauline leaves sessile, gradually reduced upward; uppermost leaves entire, linear. Capitula large, about 4 cm in dia; limb of peripheral (ligulate) florets elliptical-oblong, wide, apically 3-toothed, with middle tooth much smaller than 2 lateral. Involucral bracts glabrous or weakly hairy, with scarious, black-bordered margin; outer bracts deltoid, acute; inner apically truncate, incised along membranous margin and slightly fimbriate. Receptacle flat-hemispherical; scales oblong-lanceolate, membranous, as long as disk florets. Achenes somewhat long, extended below, punctate, with narrow border in place of inconspicuous corona. Flowering June to August.

On rocky places in alpine zone. *European part*: Upper Dniester 23 (Eastern Carpathians). *General distribution*: Central Europe, Balkans-Asia Minor (western part), Mediterranean Region (western). Described from Eastern Carpathians (Pope Ivan Mountain). Type in Berlin, several topotypes in Leningrad.

Examination of the topotypes of *A. carpatica*, *A. petraea* and *A. stiriaca*, in the Leningrad Herbarium (cf. list of exsiccatae), confirms that the same species was described under these names which, in accordance with the priority rule, should be called *A. carpatica*. Probably, the classical locality (*locus classicus*) of this species is Pope Ivan Mountain in the Marmarosha Range of the Soviet Carpathians. This point was not reported by Willdenow (l. c.), but was indicated by Kitaibel, which Domin and Krajina indicate in the note on the label to the exsiccatae issued by them (l. c.).

5. ***A. ptarmiciformis*** C. Koch in Linnaea, XXIII (1850) 319; Boiss. Fl. or. III, 289; Sosn. in Vest. Tifl. Bot. Sada, Ser. 2, 3, 175; Grossh. Fl. Kavk. IV, 120.—*A. iberica* var. *burgeana* Trautv. in Tr. Peterb. Bot. Sada, II (1873) 546.—*A. iberica* var. *minor* Medved. Rast. Kavk. I, 1 (1919) 260, quoad pl. em. Ararat, non *A. iberica* MB.—*A. iberica* auct. non MB.; Bge. Pl. Abich. 11 (1859).—*A. argaea* Boiss. and Bal. Diagn. pl. or. II, 6 (1842) 97.



Perennial. Root many-branched, producing short caudices above. Plants sericeous. Stems short, 5–10 cm high, densely leafy at base, sparsely above, leafless at apex, pubescent, simple, unicapitulate. Lower leaves small, oblong, petiolate, pinnate, with linear-oblong, entire or simple segments, sericeous; uppermost leaves almost entire. Capitula about 3 cm in dia. Involucral bracts hairy, scarious along margin, oblong, imbricate, marginal brownish fringe never broad and blackish, usually sharply demarcated, sometimes so narrow that entire involucre appears pale brown. Ligules broadly oblong, slightly longer than disk, 3-toothed. Receptacular scales as long as disk florets, cuneate, with brown border at apex; receptacle slightly concave. Flowering June to August.

On rocks and screes in alpine zone.—*General distribution*: Balkans-Asia Minor (east), Armenia and Kurdistan (north). Described from the Pontic Range (on protogenic rocks, at about 3,000 m). Type lost.

Note. Found near the border of the USSR on Mt. Ararat. Possibly growing in the Lesser Caucasus.

According to C. Koch, who described this species, it is close to *A. carpathica* but differs in pubescence and from *A. montana* L., which
24 belongs to this group, it differs by a broad brownish border of the involucral bracts.

The identity of the Caucasian plants (from Mt. Ararat) with the species described by Koch under this name was first proposed by D.I. Sosnowsky (l. c., 1927); however, to date one cannot have full confidence in the correctness of this identification, inasmuch as the authentic specimens of Koch's species, preserved in Berlin, were destroyed and not a single specimen of *Anthemis* from Koch's collections exists in the herbaria of the USSR.

Boissier (l. c.) considers *A. argaea* Boiss. (described from Argei Mountain or the Ardzhis-Dag in Turkey) as a synonym of this species. We have seen the latter species with Boissier's own label. The specimen of *A. argaea* examined by us is very similar to Caucasian specimens identified by Sosnowsky as *A. ptarmiciformis*. This indirectly confirms the correctness of Sosnowsky's identification and leads us to think that *A. ptarmiciformis* C. Koch actually grows on Mt. Ararat and possibly also in neighboring areas of the territory of the USSR.

Series 2. Anatolicae Fed.—Involucral bracts pale, whitish, with more or less membranous margin and apex. Leaves pinnately cut into approximate or remote, linear, usually narrow and small lobes of segments. Capitula usually small; limb of peripheral florets white. Rocky plants from middle and lower ranges.

6. **A. anatolica** Boiss. Diagn. pl. or. II, 11 (1849) 10; ej. Fl. or. III, 294; Grossh. Fl. Kavk. IV, 119.

Perennial. Appressed gray-pubescent, somewhat sericeous plants, about 10–15(20) cm high. Rhizomes slender, producing strong, ascending short caudices, bearing leaf rosettes or simple, or weakly branched stems in lower part. Stems slender, erect, arcuately bent below, becoming erect toward maturity, leafy in lower half, leafless above, very finely and inconspicuously longitudinally striate, usually less than 1 mm thick. Lower leaves petiolate, ovate, twice pinnately cut into small, oblong-linear, obtuse lobes; cauline leaves highly reduced. Capitula rather small, about 2 cm in dia, one on each stem, with long and thin peduncles. Involucral bracts weakly hairy, small with very narrow brownish border, pale, whitish; outer bracts triangular, somewhat acute; inner oblong, obtuse. Peripheral (ligulate) florets white; limb oblong, emarginate, scarcely as long as disk. Receptacle conical. Achenes whitish, sulcate-ribbed, auriculate; outer achenes smaller, plump, tetraquetrous, tuberculate. Flowering July to August.

In middle mountain zone, in dry stony places.—*General distribution*: Balkans-Asia Minor. Described from Asia Minor ("In 25 mountains and foothills . . . at the foot of Kadm, to the east of the city of Denizli and between Denizli and Geira"). Type in Geneva. Discovered and collected long ago in the former Kars Province near the present border of Turkey with the USSR. Possibly found in the Lesser Caucasus.

7. **A. emiliae** Sosn. in Izv. Kavk. Muz. X (1916) 1; Grossh. Fl. Kavk. IV, 120; Sosn. in Fl. Gruzii, VIII, 316.

Perennial. Plants covered with appressed grayish hairs. Root many headed, very thick, brownish, producing short caudices, bearing sterile rosettes of leaves and uncapitulate, erect or ascending, simple or branched stems up to 25 cm high, leafy only in lower part and up to middle. Lower and basal leaves long-petiolate, obovate, twice pinnately cut into obovate segments, narrowed as if into petioles and divided into obtuse small lobes; middle leaves simple pinnate; upper leaves scaly. Capitula small, up to 1.5 mm in dia, with long peduncles. Outer bracts of sparsely hairy involucre triangular; inner bracts oblong-linear, narrow-scarious and blackish along margin, slightly carinate and brownish along keel. Ligules white, 5-veined, as long as or longer than disk. Receptacle conical; receptacular scales lanceolate, acute, carinate. Achenes obpyramidal-tetraquetrous, slightly curved, longitudinally sulcate, finely tuberculate; corona oblique, serrate. Flowering June to August.

On rocks in middle mountain zone.—*Caucasus*: Eastern Transcaucasia (west). Endemic. Described from Georgia (Tana River Valley near Ateni). Type in Leningrad.

8. *A. sterilis* Stev. in Bull. Soc. Nat. Mosc. XXIX, 4 (1856) 379; Boiss. Fl. or. III, 293; Trautv. in Tr. Peterb. Bot. Sada, VIII, 393; Schmalh. Fl. II, 60; Fedtsch. and Fler. Fl. Evrop. Ross., 968; Stankov-Taliev, Opred. 381; Rubzov in Tr. Nikit. Bot. Sada, XXIX, 51.—*A. saxatilis* auct. non DC.: MB. Fl. taur.-cauc. III (1819) 581, 648.—*A. fruticulosa* MB. Fl. taur.-cauc. II (1808) 329, quoad pl. tauricam. non MB. in Tabl. prov. Casp. (1798).—*A. fruticulosa* auct. non MB.: Spreng. Syst. Veget. III (1826) 593, quoad pl. Taur.; Ldb. Fl. Ross. II, 521, quoad pl. Taur.; Fedtsch. and Fler. l. c. quoad nom.—*A. montana* auct. non L.: Ldb. Fl. Ross. II (1844–1846) 523.

Biennial or perennial. Sericeous, glaucous-gray plant. Root many-headed, with very short, scarcely visible caudices and non-flowering shoots bearing crowded rosettes of leaves. Stems slender, hard on fruiting, straight, short, about 10–15 cm high, simple, unicapitulate, leafy only below, leafless above almost throughout, arcuately bent, rather hard and erect, spreading at fruit maturity. Leaves crowded at base, with thin petiole and lamina, twice or thrice pinnately cut into few, narrow-linear or oblong-linear segments terminating into corny cusps. Capitula small, 1.5–2.0 cm in dia, with long peduncles. Involucre pubescent, pale; outer bracts deltoid, somewhat acute; inner oblong, with wide scarious margin and apex. Receptacle hemispherical. Peripheral (ligulate) florets with oblong-elliptical limb as long as disk, and usually 2-toothed at apex. Achenes somewhat oblong-sulcate, slightly angular in cross section, with auriculate process on one side; outer achenes slightly curved. Flowering May to July.

In sterile stony and sandy places near seacoast and along river banks.—*European part*: Crimea (southern coast). Endemic. Described from Crimea (“between the villages of Kapsikhor and Uskut on the southern coast, in *Juniperus excelsa* forests, on dry soil,” as well as “in stony places near Kutlak”). Type in Helsinki; isotype and paratype in Leningrad.

Note. This species is often considered to be the one described by Marschall-Bieberstein as *A. saxatilis*, but actually Bieberstein overlooked it at first in *Flora tauricocaucausica* and lumped it together with his *A. fruticulosa*, reporting the latter species not only from the Caucasus (Kurt-Bulak), as was originally done correctly but also from Crimea (Kutlak). In volume III (p. 581) of *Flora taurico-caucasica*, Bieberstein recognized his mistake and stated: “. . . habui olim pro varietate macilenta *A. fruticulosae*, sed nunc, suadente amiciss.

Steveno, specie separo et cum A. saxatili Decand. conjungo". In other words, on the advice of his friend Steven, Bieberstein segregated from *A. fruticulosa* its "deparperate" (*macilenta*) variety growing in Crimea and included it in the De Candollean species *A. saxatilis* DC. In doing this, Bieberstein committed a new, less serious mistake, not realizing that the "deparuerate" plants represent a totally new species, but ultimately understood, however, as in the very beginning, that the Crimean plant is not equivalent to the Caucasian one (the actual type of *A. fruticulosa* MB., preserved with just such a label and collected from Kurt-Bulak). It must be remembered that in fact Bieberstein did not describe any species of his own under the name *A. saxatilis*. Therefore, Steven quite consciously described his own *A. sterilis* and based it on a new type (see above), citing (as paratypes) the collections of Bieberstein from Kutlak (i.e., *A. saxatilis*). At the same time he did not forget to add that Bieberstein in *Flora taurico-caucasica* partly had this species in mind under the name *A. fruticulosa*, which originally was quite correctly attributed only to the Caucasian plant. After Bieberstein, only Ledebour (l. c.) mixed up these two species, having identified *A. saxatilis* (sensu Bieberstein) with the entirely different species *A. montana* L. without noting that the plants from Crimea do not belong to the purely Caucasian species *A. fruticulosa*. After Steven's description of *A. sterilis* and annotations to the diagnosis, it would seem that the confusion and errors should have disappeared. All this

27 was correctly shown already by Schmalhausen, but recently, Stankov (cf., Stankov and Taliev, loc. cit.) again reports both *A. sterilis* and *A. fruticulosa* from Crimea, despite the fact, of course, that nobody has ever found anything similar to true *A. fruticulosa* in Crimea.

The new specimens of *A. sterilis* from the classic locality in Crimea (village of Morskoe, i.e., Kapsikhor) were collected by N.N. Tzvelev in 1960.

9. *A. tranzscheliana* Fed. in Addenda, XXV, 866.

Perennial. Entire plant finely lanate. Root hard, woody, with an oblong branched caudex, covered with remnants of dead petioles, producing stems and sterile leaf rosette. Stems highly elongate, 30–45 cm high, simple, unicapitulate, leafy at base, lower part, and up to middle, leafless above, arcuate at base, straight and slightly sinuate above, inconspicuously striate longitudinally, not clavate below capitulum. Lower cauline leaves and those of nonflowering shoots broadly ovate, divided into linear, sparse, entire or apically 2–3-fid, divaricately pinnately cut hairy segments; rachis not toothed, narrow. Capitula medium-sized about 3–4 cm in dia. Outer bracts of more or less pubescent involucre triangular, pale brown; inner bracts oblong-

lanceolate, stramineous, with dorsally dark brown midrib, scarious at apex and sometimes with black border. Ligules white, broadly ovate, entire, divergent. Receptacle hemispherical; scales dense, stramineous, membranous, acute. Achenes (immature) brown, subglabrous; lacking corona or with very narrow apical border. Flowering May to June.

Shady rocks of middle mountain zone, in crevices.—*European part*: Crimea (southern coast). Endemic. Described from Crimea (Karadag Mountain). Type in Leningrad.

Note. This species is close to the Crimean race of *A. sterilis* Stev., but differs from it in being very tall with large capitula and thin, divided leaves with distant lobes. Large specimens (particularly the type) are not at all similar to *A. sterilis*, but smaller plants resemble this species. However, the disk even of these specimens is always very large, with a diameter up to 1.5 cm, which is never the case in *A. sterilis*—a small and, as mentioned by Steven, “depauperate” plant. The race described here is endemic especially to Karadag and was collected only from Karadag (by V.A. Transchel in 1926 and by Al. Fedorov, An. Fedorov, and M.E. Kirpicznikov in 1952).

10. **A. tempskyana** Freyn and Sint. in Bull. Herb. Boiss. III, 7 (1895) 347; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3, 175; Grossh. Fl. Kavk. IV, 120.

28 Perennial. Semishrubs. Stems woody at base, numerous, about 30–40 cm long, straight, uncapitulate, terete, with red longitudinal stripes, leafy below and not above middle; whole plant white-sericeous. Leaves of nonflowering shoots and lower cauline leaves rather long-petiolate; lamina pinnate, ovate, divided into few, rather broadly lanceolate, somewhat acute or obtuse lobes; cauline leaves short-petiolate, upper leaves sessile, gradually reduced upward, oblong; lobes oblong, small, obtuse, usually broad. Capitula rather large, 2.5–3.0 cm in dia. Involucral bracts pubescent, pale, with black border; inner bracts ovate-lanceolate, outer lanceolate, scarious at apex; all bracts somewhat acute. Ligules white, oblong-elliptical, apically crenate, two times as long as disk. Receptacle concave, scales cuneate-oblong, 3-toothed at apex. Achenes (immature) with very short corona. Flowering June to August.

In open deciduous montane forests.—*General distribution*: Balkans-Asia Minor (east). Described from Asia Minor (Gümüsane in Turkey, in maple forests of Darsosdag Mountain, and also Agridag Range). Type in Vienna; isotype in Leningrad.

Note. Quite possibly, it occurs within the limits of southwestern Transcaucasia (on spurs of the Pontic Range and along Chorokh River), as well as in Armenia. After Sintenis, who collected this species from Asia Minor, specimens corresponding completely to the type specimen

were collected by D.I. Litvinow in the former Kars Region in 1914 (mountains above the village of Bazat and the vicinity of the village of Khan-Dara).

Series 3. Fruticulosae Fed.—Involucral bracts whitish, scarious along margin and apex. Leaves pinnately cut into narrow lobes. Capitula small or medium; limb (ligules) of peripheral florets white. Semishrubs, growing on rocks of middle zones, and partly plains.

11. **A. fruticulosa** MB. Tabl. Prov. Casp. (1798) 119; ej. Besch. Casp. 201; ej. Fl. taur.-cauc. II, 329; quoad pl. cauc.; idem. l. c. III, p. 580; Spreng. Syst. veget. III, 593, quoad. pl. Cauc.; DC. Prodr. VI, 5; C. Koch in Linnaea, XXIII, 320 quoad nom.; Ldb. Fl. Ross. II, 521, pl. cauc.; Trautv. in Tr. Peterb. Bot. Sada, VIII, 449, p. p. Boiss. Fl. or. III, 288; Schmalh. Fl. II, 61; Fedtsch. and Fler. Fl. Evrop. Ross., 968, quoad nom.; Grossh. Fl. Kavk. IV, 120; Sosn. in Fl. Gruzii, VIII, 314; Stankov and Taliev. Opređ. 381, quoad nom.

Cultivated. Plants appressed white-tomentose. Root woody, many-headed, bearing numerous hard but very short, branched and then long caudices, with brown remnants of dry leaves, passing over to erect, rather thin, but hard, about 10–15 cm long, basally leafy, unicapitulate stems; caudices partly covered only with sterile rosettes of leaves. Basal and rosette leaves usually rather long-petiolate, oblong, divided into linear or ovate-oblong, very small, obtuse or acute lobes; uppermost leaves linear, finely lobed. Capitula medium, 2.0–2.5 cm in dia. Outer bracts of compressed and gray-hairy involucre deltoid-oblong, somewhat acute, membranous at apex; inner bracts obtuse, with very broad, scarious, obtuse but incised border. Ligules oblong-elliptical, white, equaling disk. Receptacular scales linear-oblong, carinate, truncate. Achenes small, tetraquetrous, with 8 grooves, and very short indistinctly lobed corona. Flowering May to July (Plate II, Fig. 2).

Dry rocks in middle mountain zone.—*Caucasus*: Ciscaucasia (Central Caucasus), Dagestan, Eastern Transcaucasia. Endemic. Described from the eastern part of the Main Range (near Kurt-Bulak). Type in Leningrad.

Note. Contrary to some reports (for example, most recently by Stankov, loc. cit.), it is not found in Crimea, which, incidentally, has long been known (for details cf. the Note to *A. sterilis* Stev.).

12. **A. trotzkiana** Claus ex Bge. Delect. sem. Dorpat. (1847) 3, in obs. Claus in Mater. k Blizh. Pozn. Prozyabaemosti Ross. Imper. 8, 2, 299; Trautv. in Tr. Peterb. Bot. Sada, VIII, 393; Boiss. Fl. or. III, 287; Schmalh. Fl. II, 62; O. and B. Fedtsch. Perech. Rast. Turk. IV, 179;

Taliev, Opređ., 571; Krascheninn, in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 334.—*A. cretacea* Zing, in sched., non Zefir.—*Pyrethrum achilleifolium* auct. non MB.; Rgl. in Tr. Peterb. Bot. Sada, I (1871–1872) 254.—*Ic.*: Krascheninn, op. cit. Fig. 674 (bona).—*Exs.*: GRF No. 3260a (topotypus!) and 3260b.

Cultivated plants. Root thick, woody, producing numerous short caudices, hard, but fragile, dark brown, covered with remnants of dry leaves; some caudices terminating into sterile leaf rosettes. Stems 10–15(30) cm high, arcuate at base, straight above, simple or slightly branched; branches leafless, uncapitulate. Young leaves white-tomentose, sometimes subglabrous later, slightly fleshy, twice pinnately cut; segments linear, small, entire or deeply divided, with cartilaginous cusps; terminal segment pinnately cut. Capitula small, about 2 cm in dia. Outer involucre bracts ovate, acute, with white-pubescent margin; inner bracts with hyaline, truncate or entire processes. Receptacle short conical and apically acute; scales oblong, abruptly acuminate, carinate, slightly shorter than disk florets. Ligules very broad, yellow. Achenes obpyramidal, tetraquetrous; corona very small, toothed. Flowering July to September.

On chalky cliffs and limestone deposits.—*European part*: Lower Volga; *Soviet Central Asia*: Aralo-Caspian Region. Endemic. Described from “chalky mountains near Khvalinsk”. Type in Leningrad.

13. *A. calcarea* Sosn. in Vestn. Tifl. Bot. Sada, XXVII (1913) 10; Grossh. Fl. Kavk. IV, 120.—*Ic.*: Sosn. op. cit., Plate 1 (phot., ad specim. typ.).

Cultivated perennials. Plants 10–20(30) cm high, with spreading or erect shoots, entirely appressed gray-pubescent. Nonflowering shoots and few simple or slightly branched, straight or somewhat curved branches at base arising from woody rhizome. Lower leaves petiolate, 4–6 cm long, oblong, pinnately cut into oblong-lobate segments, with pinnately parted lobes, with small cartilaginous cusps; cauline leaves reduced and sessile. Uppermost leaves linear-lobate or filiform. Capitula rather small, up to 2 cm in dia, terminal on stem or its branches, long-pedunculate. Involucre white-tomentose; outer bracts somewhat oblong, acute, slightly membranous at margin; inner bracts oblong-ovate, with wide membranous and serrate apical process. Ligules white, oblong, as well as involucre, but exceeding disk. Receptacle convex; scales oblong, carinate, with 3 apical teeth. Achenes sulcate-ribbed, with small corona. Flowering June to August.

On limestone rocks, in mountains.—*General distribution*: Balkans-Asia Minor (east).

Described from Olor in Olta District in Turkey (limestone rocks). Type in Leningrad. Possibly found in the Lesser Caucasus.

Note. The specimen from Olor, the third among those cited in the diagnosis, should be considered the type, because it is illustrated in the good photograph appended to the description.

Series 4. *Marschallianae* Fed.—Involucral bracts pale or brown, or with blackish border, broadly membranous at tip. Leaves pinnately cut; lobes narrow, falcately curved. Capitula large; limb (ligules) of peripheral florets golden-yellow. Plants of high-mountain zone.

14. ***A. marschalliana* Willd.** Sp. pl. III, 3 (1804) 2187; MB. Fl. taur.-cauc. II, 332; Spreng. Syst. Veget. III, 595; DC. Prodr. VI, 5; Ldb. Fl. Ross. II, 520; Schmalh. Fl. II, 62 p. p.; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3, 168; Grossh. Fl. Kavk. IV, 115; Sosn. in Fl. Gruzii, VIII, 312.—*A. marschalliana* var. *typica* Trautv. in Tr. SPb., 31 Bot. Sada, IV, 1 (1876) 148.—*A. biebersteiniana* C. Koch in Linnaea, XXIII (1850) 320; Boiss. Fl. or. III, 286; Schmalh. Fl. II, 62, excl. var.—*A. biebersteiniana* α . *marschalliana* Boiss. op. cit. p. 287; Somm. and Lev. Enum. pl. Cauc. (1900) 231, 232.—*Chrysanthemum biebersteinianum* Adam in Weber and Mohr. Beitr. Naturk. I (1805) 70.—*Chamaemelum biebersteinianum* C. A. Mey. Verzeichn. (1831) 75.—**Exs.:** Fl. Cauc. Exs. No. 149; GRF No. 624.

Perennial. Root thick, woody, producing numerous short or long, thick, brown caudices, densely and imbricately covered with scaly remnants of dead leaves; some caudices and their branches not producing stem but sterile rosettes of leaves, resulting in somewhat caespitose plant. Stems numerous, ascending, uncapitulate, about 10–15(20) cm high, leafy below. Leaves gray-sericeous; basal leaves oblong, pinnately cut into linear, approximate, acute segments; cauline leaves sessile, gradually reduced upward, with fewer lobes. Capitula about 3 cm in dia. Involucral bracts tomentose outside; inner bracts with broad and hairy scarious, brownish, but not black margin. Receptacle concave; scales carinate, apically truncate, almost deltoid. Ligules golden, as long as disk. Achenes whitish, angular, almost tetraquetrous, prolonged below, with indistinct or very short corona, slightly toothed. Flowering June to August. (Plate II, Fig. 1).

On rocky places in alpine zone.—**Caucasus:** Dagestan, Ciscaucasia (Main Range), Western Transcaucasia. Endemic. Described from Central Caucasus (Kaishaur). Type in Berlin; isotype in Leningrad.

Note. Kaishaur should be considered the collecting locality of the type. About the collecting locality of the type Willdenow (l. c.) said only: "... *Habitat ad Caucasum.*" Adam (l. c.), who independently

described this species under a different name, stated that the plant "occupies crevices in the rocks of Ossetia" ("*Occupat rupium fissaras Ossetiae*"). At the same time, on the isotype label written by Adam and bearing the name *Chrysanthemum biebersteinianum mihi* it is specified thus: "... grows on the peak of Kaishaur Mountain" ("*... habitat in summitate montis Kaischaur*"). Considering that Willdenow cited this name as a synonym and referred to the report by Count Mussin-Puschkin, for whom Adam collected plants at the time of their joint expedition to the Caucasus, one can be sure that the specimen sent by Mussin-Puschkin to Willdenow was also collected near Kaishaur.

15. **A. sosnovskyana** Fed. nom. novum.—*A. rudolphiana* Adam in Weber and Mohr. Beitr. Naturk. I (1805) 72, nom. illegit. (vide obs.); MB. Fl. taur.-cauc. II, 333; Spreng. Syst. veget. III, 596; C. Koch in Linnaea, XXIII, 321; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3, 169.—*A. rudolphiana* var. *pumila* Sosn. ex Grossh. Fl. Kavk. IV (1934) 115; Sosn. in Fl. Gruzii, VIII, 313.—*A. marschalliana* β. *rudolphiana* C. A. Mey, ex DC. Prodr. VI, (1837) 5; Ldb. Fl. Ross. II, 520; Trautv. in Tr. SPb. Bot. Sada, IV, 2, 376.—*A. marschalliana* var. *subglabrescens* DC. op. cit. 5.—*A. biebersteiniana* β. *rudolphiana* C. A. Mey. ex Boiss. Fl. or. III (1875) 287; Schmalh. Fl. II, 62, excl. nom. auct.—*A. biebersteiniana* γ. *pectinata* Boiss. Fl. or. III (1875) 287.—*Pyrethrum orientale* Willd. Sp. pl. III, 3 (1804) 2159, nom. prius sed ob homonymiam non restituendum (vide obs.).—*P. xanthomelanum* Krasch. ex Grossh. Oprod. Rast. Kavk. (1949) 459, nom. nud.—*Chrysanthemum orientale* Adam in sched. ad specim. typ. and in Willd. l. c. pro. syn.—**Exs.:** Fl. Cauc. Exs. No. 149 (sub *Anthemide biebersteiniana*).

Perennial. Plants often caespitose, consisting of large number of intertwined, woody, brown, short or long caudices, arising from root, covered with setiform or scaly remnants of dead leaves and producing stems, or sterile leaf rosette. Stems usually few, uncapitulate, at base straight or arcuately ascending, leafy only below, about 10–15(30) cm long. Leaves often almost glabrous, green, pinnately cut into relatively short acute lobes; cauline leaves gradually reduced above. Capitula up to 3 cm in dia; peripheral (ligulate) florets with wide, short-elliptical, apically distinctly 3-toothed, bright golden-yellow limb. Involucral bracts membranous on margin and at apex, with blackish-brown broad border; outer bracts deltoid, inner oblong and distinctly longer. Receptacular scales carinate. Achenes angular, usually lacking corona. Flowering June to August.

On rocks in alpine zone.—*Caucasus*: Dagestan, Ciscaucasia, Eastern and Western Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from Georgia. Type in Berlin; isotype in Leningrad.

Note 1. Even though Willdenow (l. c.) and Adam (l. c.), who redescribed this species from the same area but under a different name and with a different taxonomic status (sub *Anthemide*, non sub *Pyrethro*), mentioned only that the plant “grows in Georgia” (“in Georgia,” “in Iberia”), it is quite probable, nevertheless, that the exact collection locality of the type is Kaishaur, where the authentic specimen of the previous species was collected, and where *Anthemis rudolphiana* was subsequently collected by Marshall-Bieberstein (“in *Caucasi alpe Kaischaur*”). The specimen from Adam’s herbarium (isotype) does not mention the place of collection, and there are no other indications. Therefore, it is quite possible that it was indeed collected near Kaishaur
 35 (preserved in the herbarium together with the type specimen of *Anthemidis marschallianae* [sic] and it was considered unnecessary to make separate mention of the collecting site).

Note 2. Restoration of the original Willdenowian specific epithet “*orientalis*” is not possible because the binomial name *Anthemis orientalis* (L.) Degen, based on the earlier basionym *Anacyclus orientalis* L., was already in use. But since the name “*rudolphiana*” was superfluous at the time of its publication, then in accordance with the International Code of Nomenclature, the name of the author (Adam) should be dropped henceforth after the species name *Anthemis rudolphiana*, or a new name should be given to this species. We prefer to call it by the new name *A. sosnovskyana*, in honor of Prof. D.I. Sosnowsky, who contributed much toward an understanding of the systematics of the genus *Anthemis*. The recent (Grossheim, 1949, l. c.) name, *Pyrethrum xanthomelanum* Krasch. ex Grossh., which was used erroneously to designate a certain specimen of *A. sosnovskyana*, cannot be used as basionym for a new combination, because the name *P. xanthomelanum* is invalid, being only a *nomen nudum*.

Section 2. *Anthemis*—Sect. *Chamaemelum* Cass. in Dict. Sc. Nat. XXIX (1823) 279 p. p.—Sect. *Euanthemis* ser. *Annuae* Boiss. Fl. or. III (1875) 276 p. p.—Achenes obtuse or truncate at apex, with or without auriculate corona, not compressed. Receptacular scales oblong or lanceolate. Annual or biennial herbs, with highly divided pinnate leaves and usually branched stems. Capitula often lacking ligulate florets.

Type of section: Lectotype of genus.

Series 1. *Arvenses* Fed.—Inner involucre bracts obtuse, with membranous margin. Stems 20–30(40) cm high branched. Pubescence appressed or somewhat squarrose, velutinous.

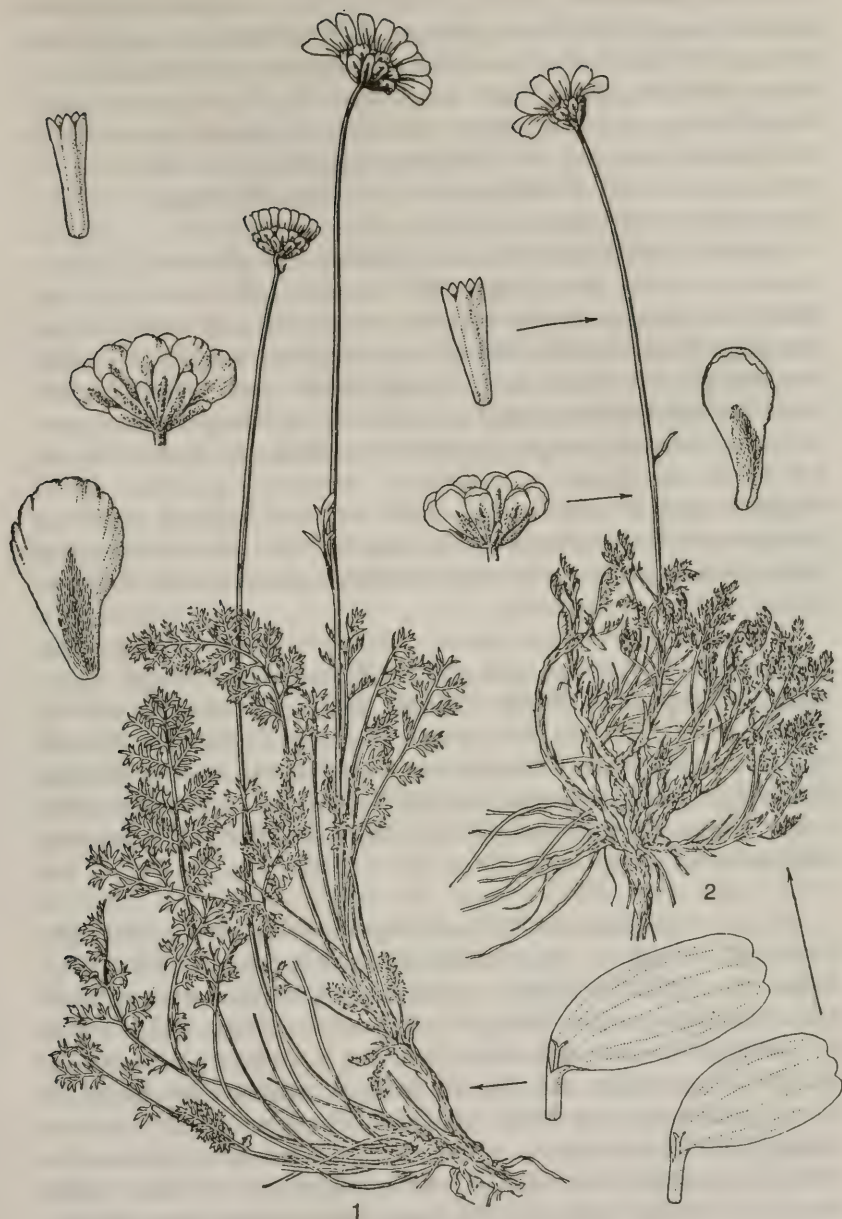


Plate II.

1—*Anthemis marshalliana* Willd., habit, involucre, inner involucre, ray (ligulate) floret, and disk floret; 2—*A. fruticulosa* MB., habit, involucre, inner involucre, ray (ligulate), and disk floret.

16. **A. arvensis** L. Sp. pl. II (1753) 894; DC. Prodr. VI, 6; MB. Fl. taur.-cauc. III, 582; Ldb. Fl. Ross. II, 521; Boiss. Fl. or. III, 301; Schmalh. Fl. II, 61, excl. var.; Fedtsch. and Fler. Fl. 968, excl. var.; Grossh. Fl. Kavk. IV, 119; Fl. Yugo-Vost. VI, 334; B. Fedtsch. Rast. Turk. 735.—*A. multicaulis* Boiss. and Heldr. in Boiss. l. c. pro syn.—**lc.**: Fedtsch. and Fler. Fl. 968; Fl. Yugo-Vost. VI, 460, 459, 15 (achene).—**Exs.**: Pl. Finn. Exs. No. 976; Herb. Fl. Ingriae, No. 311; Fl. Polon. Exs. No. 641.

Annual. Appressed-pubescent, slightly ash-gray plants. Stems numerous, arising from single root, branched, 15–30(40) cm long. Leaves oblong, pinnately cut into narrow, linear-cuneate, acute segments. Peduncles of inflorescences oblong, somewhat clavate. Involucre hispid; bracts ovate-oblong, outer acute, others obtuse, 36 broadly scarious on margin and apex. Receptacle oblong-conical; scales lanceolate, carinate, abruptly cuspidate, exceeding disk florets. Capitula 2–3 cm in dia; ligules of peripheral, exclusively pistillate, florets elliptical; tube of disk florets swollen at base. Achenes somewhat tetraquetrous, longitudinally sulcate, smooth; outer achenes somewhat plump, inner with short acute border at apex in place of truncate corona. Flowering May to September.

Long dry herb-covered places, fields.—*European part*: Karelia-Lapland (south), Ladoga-Ilmen, Baltic Region, Upper Volga, Upper Dnieper, Volga-Don, Middle Dnieper, Upper Dniester, Bessarabia, Black Sea Region, Lower Don, Crimea; *Caucasus*: Ciscaucasia, Western Transcaucasia. *General distribution*: Scandinavia, Atlantic Europe, Central Europe, Mediterranean Region, Balkans-Asia Minor. Described from "Europe, especially from fields of Sweden" ("*Europae, praesertim Sueciae agris*"). Type in London.

17. **A. ruthenica** MB. Fl. taur.-cauc. II (1808) 330 and 465; DC. Prodr. VI, 11; Ldb. Fl. Ross. II, 522; C. Koch in Linnaea, XXIII, 315; Boiss. Fl. or. III, 304; Grossh. Fl. Kavk. IV, 119; Krascheninn, in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 335.—*A. maritima* Pall. ex MB. l. c. pro syn. *A. maritima* L. non *A. arvensis* β . *ruthenica* Schmalh. Fl. II (1887) 61; Fedtsch. and Fler. Fl. 968.—*A. pontica* Ldb. op. cit. p. 5.—*A. pontica* auct. non Willd.: d'Urville. Enumerat. (1822) 114.—*A. pontica* d'Urville in Ldb. l. c. pro syn.—*A. neilreichii* Ortmann in Flora (1852) 672.—**lc.**: Javorka-Soo, Növen kiz. t. 146, f. 884 (mediocr.).—**Exs.**: GRF No. 733; Lang. and Szovitz, Herb. Ruthen. Cent. I, No. 8; Schultz. Herb. normale, No. 504 (sub *A. neilreichii*); Dörfler, Herb. normale, No. 5275.

Annual. Tomentose-lanate, many-stemmed plants, highly branched from base. Stems short, 15–20 cm high, with straight, divergent,

divaricate branching. Leaves oblong, divided into linear or oblong-lobate segments with deltoid acute lobes. Peduncles of capitula long, but not clavate below capitulum; capitula about 2 cm in dia. Involucre hispid; bracts pale; outer bracts acute, inner oblong and obtuse, with wide scarious margin. Receptacle conical; scales lanceolate, acute, membranous except midrib, equaling disk. Ligulate florets only pistillate; ligules white, elliptical, tube of disk florets swollen at base. Achenes smooth, obconical; outer achenes deeply sulcate-angular, inner sulcate, all truncate, very narrowly and usually indistinctly bordered at tip, i.e., almost lacking corona. Flowering May to July.

In steppe and partly forest-steppe zone.—*European part*: Upper Volga, Upper Dnieper, Bessarabia, Middle Dnieper, Volga-Don, Trans-Volga Region, Black Sea Region, Crimea; *Caucasus*: Ciscaucasia, Dagestan, Eastern and Western Transcaucasia. Described from Crimea and Ukraine. Type could not be located.

- 37 *Series 2. Candidissimae* Fed.—All involucre bracts somewhat acute. Stems short, (5)10–15 cm high, divaricate from base, simple or branched. Pubescence dense silvery-tomentose and somewhat squarrose or appressed.

18. **A. candidissima** Willd. ex Spreng. Syst. nat. III (1826) 593; DC. Prodr. VI, 9; Boiss. Fl. or. III, 305; Ldb. Fl. Ross. II, 523; Grossh. Fl. Kavk. IV, 119; Sosn. in Fl. Gruzii, VIII, 317; B. Fedtsch. Rast. Turk. 735(?).—*A. candidissima* var. *epapposa* and *intermedia* Trautv. in Tr. Peterb. Bot. Sada, IV (1876) 337.—*A. pterygantha* C. Koch in Linnaea, XVII (1843) 44; Ldb. Fl. Ross. II, 522.—*A. peregrina* auct. non L.; MB. Fl. taur.-cauc. II (1808) 331.—*A. chamamilloides* Stev. ex MB. l. c. pro syn.; C. Koch in Linnaea, XXIII, 316.—*Ic.*: Takht. and Fedor. Fl. Erevana, Atlas, Plate 107 (mediocr.).

Annual. Entirely silvery-tomentose plants, with roots simple or branching from collar. Stems short, 5–10(15) cm high with erect branches. Leaves short-ovate, 2–3-pinnatisect into narrow-linear, acute segments; lobes ternate or palmately divided, approximate. Peduncles of inflorescence slender, long, but not clavate; capitula small, 1.5–2.0 cm in dia. Involucre lanate, bracts lanceolate, acute. Receptacle conical; scales narrow linear-lanceolate, carinate, acuminate, as long as disk florets. Corolla tube swollen at base. Achenes small, roundish in cross section or indistinctly tetraquetrous, slightly tuberculate along ribs on outside; all achenes truncate at apex, lacking corona or with acute and very narrow apical border, sometimes nonuniformly developed. Flowering May to June. (Plate IV, Fig. 2).

In semidesert region.—*Caucasus*: Eastern Transcaucasia, Southern Transcaucasia; *Soviet Central Asia*: Kara-Kum, Kyzyl-Kum. Described from Caucasus (Georgia). Type in Berlin; isotype in Leningrad.

Note. On the basis of Willdenow's herbarium, Sprengel (l. c.) described under the name *A. candidissima* undoubtedly a duplicate of the same plant which was found also in the herbarium of Marschall-Bieberstein (collections of Adam) and whose specimens (isotypes) were sent to Willdenow, probably, by Mussin-Puschkin. However, Willdenow failed to establish a new species based on them in "*Species plantarum*," which was subsequently done by Sprengel. Marschall-Bieberstein himself considered his plants identical with the western (southern European) species *A. peregrina*, which is why Sprengel cited this name in his diagnosis as a synonym. Thus, there is sufficient reason to consider the specimen from Georgia (*Ex Caucaso Iberico*), preserved in Bieberstein's collection, as an isotype of *A. candidissima*.

We have cited the synonym *A. pterygantha* C. Koch relying on Boissier's authority, who identified the Koch's plants with *A. candidissima*. Unfortunately, many species described by Koch remained
38 poorly explained, until almost all the authentic specimens perished. Koch's original diagnoses have long provoked justified criticisms for their poor and sometimes defective description (the exact collecting site and other details are not mentioned).

19. *A. grossheimii* Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927) 176; Grossh. Fl. Kavk. IV, 119; Sosn. in Takht. and Fed. Fl. Erevana, 307.—*A. candidissima* var. *longepapposa* Trautv. in Tr. Peterb. Bot. Sada, IV (1876) 337.

Annual. Plants appressed-hairy, grayish-green or grayish, with numerous, short, up to 8 cm high, branched, erect stems, arising from root collar. Leaves ovate-oblong, thrice pinnately cut into short, fine, filiform, divaricate lobes, with hyaline cusp. Capitular peduncles long, later somewhat thickened. Involucre appressed-hairy; bracts pale brownish along margin, membranous, green outside; all bracts lanceolate, with acute and emarginate apex. Receptacle conical; scales oblong-lanceolate, carinate, apically truncate, serrate, with cusp, as long as florets. Peripheral florets white, fertile, with elliptical ligules as long as disk; tubes of all florets not swollen, pale-ocher-yellow. Outer achenes small, terete, prominently ribbed and tuberculate, plump, lacking corona, achenes of disk florets narrow-obpyramidal, prominently ribbed, less tuberculate, with serrate-incised auricles, thrice as long as achenes. Flowering May to June.

In semideserts.—*Caucasus*: Southern Transcaucasia. Endemic. Described from Armenia (Yerevan, on stony slopes). Type in Tbilisi.

Note. According to D.I. Sosnowsky (l. c.), this species is close to *A. haussknechtiana* Boiss. and Reut., but differs in having pale yellow and not swollen corolla tubes.

20. *A. hirtella* Winkl. in Tr. SPb. Bot. Sada, XI, 2 (1892) 278; O. and B. Fedtsch. Perech. Rast. Turk., IV, 179; Zakirov in Tr. Uzbeksk. Univ. Nov. Ser. No. 89, 147.

Annual. Plants entirely grayish-tomentose, 10–15 cm high, with branched stems; branches leafy up to middle, but always bearing solitary capitula and leafless peduncles of inflorescence. Leaves 2–3 cm long, twice pinnately divided; lobes ovate-lanceolate, somewhat acute. Peduncles of inflorescence clavate below capitulum; capitula somewhat large, hemispherical, about 12 mm in dia. Receptacle conical, punctate; receptacular scales lobate, membranous, but split toward apex, with acute cusp. Involucral bracts numerous; outer bracts leafy, broadly membranous along margin; lanate-hairy outside, broadly lanceolate, 39 acute; inner bracts slightly narrowed, gradually becoming membranous (inward); innermost bracts similar to receptacular scales. Peripheral florets pistillate, ligulate; ligules somewhat broad, oblong-roundish, longer than involucre, white, with 3 subobtusate teeth; corolla tube swollen, lanate outside; disk florets yellow, tubular; tube constricted in middle (resembling sand clock in shape), with 5 apical teeth. Anthers very short-sagittate; style branches short, almost erect, truncate, clustered. Achenes turbinate, with longitudinal striations, lacking corona. Flowering April.

In desert region.—*Soviet Central Asia*: Pamiro-Alai. Endemic. Described from Tadzhikistan (eastern Bukhara, Karatau Range, at source of Chiglin River). Type in Leningrad.

Note. It is close to *A. hemistephana* Boiss., but its achenes lack a corona, whereas the latter species has a unilateral corona.

Actually, Winkler's article (*Decas septima* . . .) was published in 1892, but 1890 is mentioned on the title page of the reprints, which can be considered as the time of publication of *A. hirtella*.

Section 3. Cota (J. Gay ex Guss.) Rupr. Fl. Ingr. (1860) 589; Boiss. Fl. or. III, 278.—Sect. *Euanthemis* DC. Prodr. VI (1837) 7 p.p.—*Cota* J. Gay in Guss. Fl. Sic. Syn. II (1842–1844) 866, pro gen.—Achenes tetraquetrous, with somewhat sharp corners, usually highly compressed. Receptacular scales carinate. Stems usually sparingly branched; capitula often large. Perennial or biennial plants with pinnate leaves; leaf lobes somewhat broad.

Type of section: *A. tinctoria* L.

Series 1. Tinctoriae Fed.—Involucral bracts pale; peripheral (ligulate) florets golden-yellow. Stem branched or simple. Leaves grayish from pubescence or green and subglabrous. Perennials.

21. *A. tinctoria* L. Sp. pl. II (1753) 896; Ldb. Fl. Ross. II, 524, excl. var.; Boiss. Fl. or. III, 280 p. p. excl. var. and syn.; Schmalh. Fl. II, 61 p. p., excl. var.; Fedtsch. and Fler. 967 p. p.; Sosn. in Fl. Gruzii, VIII, 306, quoad nom.; Grossh. Fl. Kavk. IV, 116, excl. syn. quoad nom.; Kryl. Fl. Zap. Sib. XI, 2720, quoad nom.—**lc.**: Syreistsch. Fl. III, 260 (mediocr.).—**Exs.**: GRF No. 3700; Fl. Finl. Exs. No. 975; Fl. Polon. Exs. No. 352a and b; Herb. Fl. Ingr. No. 312; Pabo and Tscholowskii, Herb. Mohil. XIX, 2.

Perennial. Plants usually with many stems. Stems virgate, especially at fruiting, strong, 30–40(60) cm high, reddish, often cymosely and divaricately branched. Leaves appressed-hairy, greenish (not gray), oblong, pinnately divided into oblong, usually folded and compressed segments, with deltoid-lanceolate, acute, pectinate lobes, terminating into white cusp; leaf axes serrate. Capitula rather large, up to 3 cm in dia, with long peduncles. Involucre subglabrous, bracts pale; outer bracts lanceolate, more or less acute; inner oblong-linear, with obtuse, scarious apex. Ligules yellow, shorter than disk. Receptacle hemispherical; scales broadly linear, carinate, acuminate almost as long as disk florets. Achenes rectangular-compressed, with many grooves on both sides and very short, almost entire, corona at tip. Flowering June to September.

In dry meadows, fields and weedy places.—*European part*: Karelia-Lapland (south), Ladoga-Ilmen, Baltic Region, Upper Volga, Dvina-Pechora (south), Volga-Kama. *General distribution*: Scandinavia, Central Europe, Atlantic Europe, Mediterranean Region (north). Described from “dry sunny meadows of Sweden and Germany.” Type in London.

Note. The northern (especially Swedish) plants (topotypes) should be considered as typical specimens of *A. tinctoria*, which are characterized by highly branched stems with many capitula. In this northern race, the ligules are intensely golden-yellow (not pale), the leaves green, and the stems distinctly reddish. Another race, *A. subtinctoria* Dobrocz., grows in the south, beginning from the Ukraine and southeast, as well as in Crimea and the Caucasus, in addition to a whole series of endemic races with small distribution ranges. *A. subtinctoria* differs quite sharply from typical *A. tinctoria* by having grayish pubescence, narrow leaf segments, and pale ligules.

A hybrid, *A. tinctoria* × *A. cotula*, was found in the former Venev District in the former Tula Province, which was identified as *A. bollei*

Sch.-Bip. We have not included this form among the species of *Anthemis*, as hybridization apparently is a common feature among its species, but the degree of constancy of the hybrids is unknown. As regards the name *A. bollei*, it is hardly suitable in the present case. The Venev hybrid probably appeared spontaneously and entirely independently of the hybrid form described from Western Europe under this name. Concerning *A. bollei* from Venev, see Majeovsky "*Fl. Sred. Russ.*" [Flora of Central Russia], Ed. 5 (1917) 301, edited by D. Litvinow, where this form was first reported on the basis of the published notes and herbarium of V.V. Rozen who collected it in 1912 in the locality mentioned above.

The characteristics of the Venev hybrid, according to Litvinow (l. c.), are as follows: "Outer florets yellowish-white. Stem erect, quite branched, sparsely pubescent (like leaves). Leaves 2-pinnatifid; lobes pectinate, linear or linear-lanceolate, with entire or dentate margin or with two or three notches; lobes of first order close together. Capitula long-pedunculate. Involucral bracts obtuse, somewhat oblong. Receptacular scales lanceolate-linear, with prickly cusp. Annual, 35–45.

According to A.A. Grossheim (*Fl. Kavk.*, p. 121), the hybrid form, also called *A. bollei* by him, was found in the northern Caucasus.

22. ***A. subtinctoria*** Dobrocz. in Ukr. Bot. Zhurn. XVIII, 2 (1961) 67, Fig. 2.—*A. caucasica* Henckel, Adumbrat. plant. nonnull. Horti Halensis Acad. Select. (1806) 9, non Adam (1805).—*A. kochiana* Sosn. ex Grossh. Fl. Kavk. IV (1934) 116, pro syn.—*A. chrysantha* Sosn. ex Grossh. l. c. pro syn. and in Opred. Rast. Kavk. (1949) 452, non Gay.—*A. tinctoria* var. *chrysantha* Trautv. in Tr. Bot. Sada, IV (1876) 377.—*A. tinctoria* β. *macro-glossa* C. Koch in Linnaea, XXIII (1850) 318.—*A. tinctoria* β. *floribus pallidis* C. Koch op. cit. XVII (1843) 44.—*A. tinctoria* auct. non L.: Ldb. Fl. Alt. IV, 122; B. Fedtsch. Rast. Turk. 735; Kryl. Fl. Zap. Sib. XI, 2720; M. Popov, Fl. Sr. Sib. II, 725; Katina in Vizn. Rosl. URSR, 536; Kraschennin, in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 334.—*A. pallescens* auct. non Heldr.: Trautv. in Tr. Bot. Sada, VIII, 391.—**Exs.**: Callier, Iter. taur. (1900) Nos. 631–632 (sub *A. tinct.*).

Perennial. Plants grayish from more or less dense and somewhat appressed hairs. Stems 30–50(70) cm high, branched usually in lower part, less often simple, often not spreading. Leaves oblong-ovate or oblong, divided into narrow linear segments, with few divergently sharp-toothed cuspidate lobes. Capitula medium, up to 2–3 cm in dia, less often larger; ligules yellow, sometimes pale yellow, oblong-lanceolate, narrowed at apex and with 3 teeth, equal to disk or larger. Involucre

hairy; outer bracts oblong-deltoid, acute; inner bracts oblong-lanceolate, somewhat obtuse, lacking fimbriate apex; all bracts pale, lacking green or brownish vein. Receptacle hemispherical; scales brownish, oblong, abruptly narrowed into darker cusp. Flowering June to August.

European part: Black Sea Region, Lower Don, Volga-Don, Trans-Volga Region, Crimea; *Caucasus*: All regions; *Siberia*: Upper Tobol, Irtysh, Angara-Sayans (rarely); *Soviet Central Asia*: Lake Balkhash Region. Endemic. Described from the Black Sea Region of Ukraine (Stalino Region [now Donetsk Region—Ed.], Novoazovsk Region, "Khomutovskaya Steppe" Reserve). Type in Kiev.

23. **A. maris-nigri** Fed. Addenda, XXV, 866.

Perennial. Plants sparsely covered with short or longer hairs, but green or slightly grayish. Stems arising from somewhat woody root, arcuate below, erect above, with spreading branches, about 40–60(70) cm high, strong, longitudinally striped, leafy up to middle and above, leafless near tip. Basal leaves; caducous; cauline leaves obovate, somewhat wide, pinnate, divided into somewhat obtuse and rather wide oblong-linear, sharply toothed segments, teeth uneven, pointed forward, with very small cusps. Capitula rather small, about 2 cm in dia; ligules yellow, short, obtuse, indistinctly 3-toothed at apex, almost a half as long as disk. Involucre lanate; outer bracts deltoid, sharply acute; inner bracts oblong-lanceolate, somewhat obtuse, all bracts blackish on midrib, brownish-ribbed at apex. Receptacle hemispherical; scales
42 brown, oblong, abruptly narrowed into an obtuse cusp. Achenes (immature) stramineous, indistinctly tetraquetrous, with indistinct teeth at apex, glabrous. Flowering June to September.

In montane forest zone.—*Caucasus*: Western Transcaucasia (Kolkhida). Endemic. Described from cliffs between Nakhe and Chukhuk rivers in Sochi District. Type in Leningrad.

24. **A. saguramica** Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927) 150; Sosn. in Sosn. and Grossh. Opred. Rast. Tifl. (1920) 284, nom. nud.; Grossh. Fl. Kavk. IV, 116; Sosn. in Fl. Gruzii, VIII, 305.

Perennial. 40–50(70) cm high plants, sometimes with nonflowering shoots at base. Stems erect, branched in upper half, spreading, angular, striate at base, subglabrous or grayish from scattered curly hairs. Lower cauline leaves early falling, petiolate, spatulate, pinnately cut; segments oblong, along margin sharply toothed or bipinnate; middle leaves sessile, ovate, pinnate; segments gradually reduced toward leaf base, lowermost segments amplexicaul, somewhat broadly spatulate, divided to middle into short, oblong, sharply acute, toothed lobes; all leaves greenish, glaucous beneath, gradually reduced upward; some upper leaves scaly,

pinnately toothed. Capitula on very long, subglabrous peduncle, medium, about 2.0–2.5 cm in dia. Involucral bracts linear-lanceolate, acute, white-pubescent, narrow membranous at apex. Ligules golden, oblong, as long as disk, with small teeth at apex. Receptacle hemispherical; scales narrow and sharply acute, brownish, indistinctly carinate outside. Flowering June to September.

In middle mountain zone.—*Caucasus*: Eastern Transcaucasia (west). Endemic. Described from Georgia (Sagurami). Type in Tbilisi; autotypes and topotypes in Leningrad.

25. **A. markhotensis** Fed. in Addenda, XXV, 876.

Perennial. All plants sericeous-lanate from dense hairs. Stems branched and leafy in middle, about 40–50(60) cm high, leafless at base and below capitula, longitudinally striped, reddish. Leaves dense, rather large, about 3–4 cm long, obovate, pinnate; segments somewhat wide, oblong-obovate; lobes truncate obconical-dentate. Capitula rather large, about 2–2.5 cm in dia; ligules yellow, short, roundish at apex, entire or sometimes indistinctly toothed, oblong-ovate, distinctly shorter than disk. Involucre lanate; outer bracts deltoid, acuminate, inner bracts oblong, somewhat obtuse; all bracts pale. Receptacle spherical; scales 43 brown; outer scales gradually narrowed into cusp, inner abruptly narrowed into emerginate cusp or bilobate tip. Achenes stramineous, glabrous, slightly ribbed, unevenly and indistinctly toothed at apex. Flowering June to September.

On cliffs of coastal limestone rocks and partly on herb slopes in calcareous soil.—*Caucasus*: Western Transcaucasia (western part). Endemic. Described from Markhot Range. Type and paratypes in Leningrad.

26. **A. monantha** Willd. Sp. pl. III, 3 (1804) 2187; Zefirov in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI, 370–372, XVIII, 253, 254 p. p.; N. Rubzov in Tr. Nikitsk. Bot. Sada, XXIX, 50, in obs.—*A. coarctata* auct. not Sibth. and Sm.: Trautv. in Tr. Peterb. Bot. Sada, IX (1884) 391.—*A. tinctoria* var. β . MB. Fl. taur.-cauc. II (1808) 332.—*A. tinctoria* var. *monantha* DC. Prodr. VI (1837) 11; Ldb. Fl. Ross. II, 524.—*A. tinctoria* var. *uniflora* MB. in sched. (1810).

Perennial. Stems 1–2, simple, about 25–30(40) cm high, unicapitulate, sparsely pubescent like leaves, rather slender, erect, somewhat arcuate at base, generally leafy only below, less often up to middle, leafless above. Leaves small, somewhat wide, up to 1.5–2.0 cm long, pinnate; segments linear, divergent, finely and sharply incised-toothed, greenish (not gray). Capitula medium, about 2.0–2.5 cm in dia, with narrow-oblong or lanceolate, bright yellow ligules, lacking

apical teeth. Involucre slightly hairy; outer bracts acute-deltoid, lacking greenish veins; inner bracts oblong, somewhat obtuse. Receptacular scales oblong, brownish, terminating into long cusp. Flowering June to August.

In mountains, on herb slopes.—*European part*: Crimea. Endemic. Described from Crimea. Type in Berlin.

Note. B.M. Zefirov, who for the first time established this species for the Crimean flora after a long period of oblivion, understood it in the broad sense, including the yellow chamomile of the affinity of *Anthemis tinctoria* s. l., which very often has tall, branched stems, and grayish leaves with narrow lobes and is the most widely distributed race in the south of the European USSR, especially in Crimea and the Caucasus. However, D.N. Dobroczaeva (personal communication) quite correctly segregates this race as a separate species, *A. subtinctoria* (cf.), assigning the name *A. monantha* Willd. only for the Crimean montane yellow-flowered chamomile, which always has simple unicapitulate stems and greenish (not gray) leaves with thin pubescence not imparting the typical grayish appearance to the plant as found in *A. subtinctoria*.

27. **A. cretacea** Zefir. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 371; N. Rubzov in Tr. Nikitsk. Bot. Sada, XXIX, 50.

- 44 Perennial. Stems numerous, ascending, partly prostrate, highly branched from base, 10–20 cm high, finely tomentose, leaves almost glabrous above, lanate-tomentose beneath, ovate, 10–15 mm long, pinnately cut into 2–5 narrow-lanceolate segments on each side, further divided into oblong-lanceolate, acute lobes. Capitula solitary terminal on branches, 1.2–1.8 cm in dia. Outer bracts of arachnoid involucre lanceolate, green, with pale border on margin; inner bracts obtuse, with fimbriate apices, brownish. Ligules bright yellow, slightly shorter than disk. Receptacle almost hemispherical; scales shortly acute. Achenes compressed-tetraquetrous, slightly curved, with unequally toothed and very short border at tip. Flowering June to August.

On chalk slopes, limestone deposits, in middle and lower mountain zone.—*European part*: Crimea; *Caucasus*: Western Transcaucasia (west). Endemic. Described from Crimea (Mangub-Kale, chalky scree). Type in Leningrad.

Note. At first glance, the holotype of this species gives the impression of a small specimen of the common *A. tinctoria* (or *A. subtinctoria*) that grows in poor soil and is also grazed by cattle. However, we collected an *Anthemis* in 1952 near Gelendzhik in the Caucasus from limestone rocks that is very similar to *A. cretacea*, but

with simple, and not branched, unicapitulate stems. These specimens can all be referred to *A. cretacea* evidently, and at the same time, it can be suggested that the branching of the type specimen and the large number of small capitula on the lateral shoots is the result of cattle grazing, causing the regeneration of branches. Normally, *A. cretacea* is a plant with unbranched stems, each bearing a single capitulum.

28. *A. debilis* Fed. in Addenda, XXV, 867.

Perennial. Plants grayish from short and rather dense hairs. Stems arising from hard brownish root, ascending and weak, sparingly branched or simple, rather slender, about 15–20(40) cm high, leafy up to middle, leafless above. Leaves only cauline, dense, reduced, small, about 7–10(15) mm long, broadly ovate, pinnate, with linear, acute, truncate-toothed approximate segments in turn divided into acute lobes with small cusps. Capitula medium or small, about 2.5 cm in dia; ligules golden gray, sometimes divergent, oblong-lanceolate, with indistinct apical teeth. Involucre lanate; all bracts pale; outer bracts deltoid, greenish on midrib; inner bracts oblong-lanceolate, somewhat obtuse, more densely tomentose at tip. Flowering May to June.

On rocky cliffs and other similar sterile places.—*Caucasus*: Western Transcaucasia (south, occurrence possible). *General distribution*:
45 Balkans-Asia Minor (east). Described from Asia Minor (Artvin District, Godrokhevi Ravine); type and paratypes in Leningrad.

Note. One might think that this species had already been described earlier by C. Koch as *A. brachyglossa* C. Koch. However, Koch's diagnosis is so poor that there can be no certainty in such assumption. Besides, the type specimen, on the basis of which Koch described his plant, perished irretrievably like the other authentic specimens preserved in Berlin after Koch's death. The other assumption about the possible identity of *A. debilis* m. and *A. brachyglossa* C. Koch is based only on Koch's report that his species is found in the Chorokh District ["... im Tschorukgebiete". C. Koch in *Linnaea*, XXIII (1850) 318]. In order to simplify the further attempts at elucidation of *A. brachyglossa* C. Koch, a translation of the original diagnosis from Koch's publication is given here: "Perennial (plant), gray due to dense appressed pubescence. Stems branched at base, ascending, 1/2 foot or little taller, with almost simple branches, unicapitulate, leafless above. Leaves ovate-oblong, 5–7 mm long, pinnatipartite with oblong lobes, incised-dentate, with very sharp teeth. Capitula hemispherical. Involucral bracts imbricate, tomentose. Ligules golden, highly reduced, later recurved downward. Scales (receptacular) oblong, abruptly narrowed into cusp, equaling disk florets. Achenes distinctly bordered laterally, with 3 stripes on dorsal and ventral sides, glabrous, with very short corona."

29. **A. zephyrovii** Dobrocz. in Ukr. Bot. Zhurn. XVIII, 2 (1961) 70, Fig. 1.—*A. monantha* var. *orientalis* Zefir. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 253–254, absque diagn. lat.

Perennial. Root strong, woody, thick, bearing short, erect, spreading stems. Stem leafless below, but with remnants of dry leaf petioles, densely leafy in middle, rather thick, up to 2 mm or more in dia, slightly reddish, and like leaves rather densely grayish-pubescent, simple or weakly branched, with solitary terminal capitula on each branch or stem. Leaves rather large, up to 3–4 cm long, grayish-pubescent, broadly ovate, pinnately cut into linear segments, sharply incised-serrate along margin and remote. Capitula medium or rather small, with narrow yellow ligules. Involucre lanate; outer bracts acute-deltoid; inner bracts oblong, somewhat acute, lacking apical fringe and greenish midrib. Flowering June to August.

On stony slopes, in foothills, sometimes in oak forests.—*European part*: Crimea (Kerch Peninsula). Described from the above mentioned region (near the village of Marfovka). Type in Leningrad.

46 **Note.** B.N. Zefirov (l. c.), who first discovered this species but described it as a variety (of *A. monantha*), noted its characteristic feature: "Stem . . . often branching already from middle; leaves oblong in their general outline, noticeably exceeding very short internodes." The range of this species covers only the eastern part of Crimea (Kerch District, Feodosia), spreading along the southern coast not farther west than Karadag and Sudak.

Series 2. Rigescentes Fed.—Involucral bracts greenish or whitish, lacking dark broader; peripheral (ligulate) florets white. Stems slightly branched or simple. Leaves green or grayish, with sparse or dense pubescence, or glabrous. Perennials.

30. **A. rigescens** Willd. Hort. Berol. I (1816) 75; Boiss. Fl. or. III, 28 p. p.; Fedtsch. Rast. Turk. 735, quoad nom.; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3, 158, diagn. lat. compl.; Fl. Gruzii, VIII, 308.—*A. rigescens* var. *latifolia* Sosn. ex Grossh. Fl. Kavk. IV (1934) 118.—*A. rigescens* var. *genuina* C. Koch in Linnaea XXIII (1850) 317.—*A. caucasica* Hornem. Hort. Hafn. II (1813) 832, non Henk. (1806), nec Adam (1805).—*A. triumfettii* auct. non All.: Ldb. Fl. Ross. II (1844–1846) 525, p. max. p.—*A. tinctoria* var. *triumfettii* Trautv. in Tr. Bot. Sada, IV (1876) 337, non *A. triumfettii* All.—*A. tinctoria* var. *rigescens* Schmalh. Fl. II (1897) 62 p. p.—**!c.**: Willd. loc. cit. t. 62 (bona).

Perennial. Sparsely appressed-hairy or almost glabrous, green plants. Stems short, 40–50(70) cm high, simple or cymosely branched, erect. Leaves broadly ovate-oblong, pinnately cut into oblong-lanceolate

segments, divided into deltoid pale-acuminate and usually also toothed-pectinate lobes, with a broad, toothed, rachis. Capitula long-pedunculate, usually large, up to 3 cm in dia. Involucral bracts pubescent or subglabrous; outer bracts deltoid-lanceolate, somewhat acute; inner bracts oblong-linear, obtuse, with scarious apex, pale or slightly blackish, somewhat fimbriate along margin. Ligules white, as long as disk or longer. Receptacle hemispherical; scales oblong, carinate, terminating into cusp as long as disk florets. Achenes tetraquetrous-compressed, narrow-winged, with numerous stripes on both sides and short corona. Flowering July to August.

In subalpine zone, meadows.—*Caucasus*: Ciscaucasia, Dagestan, Eastern, Western and Southern Transcaucasia. *General distribution*: Balkans-Asia Minor, Armenia-Kurdistan. Described from a specimen raised in the Berlin Botanical Garden. Place of seed collection not mentioned in description. Type in Berlin.

Note 1. Specimens received at one time from Chamisso from the Berlin Botanical Garden were found in the Leningrad herbarium. Most probably, these specimens were raised even by Willdenow from the
47 seeds undoubtedly collected from the Caucasus. The specimens totally resemble the description and diagram given by Willdenow in *Hortus Berolinensis* (l. c.). Thus, these specimens are none other than the isotypes of *A. rigescens* described by Willdenow. Attention must be drawn to the fact that the pubescence of these plants is very sparse, the leaves are green, the lobes of the leaves fairly broad, and the involucre not as pale as in *A. dumetorum* Sosn., and also not as black-bordered as is typical for *A. macroglossa* Somm. and Lev. and some other species.

Note 2. *A. sachokiana* Sosn. ex Grossh. [Grossheim *Fl. Kavk.* IV (1934) 117], described very briefly only in Russian and without designation of the type, is also listed in the Flora of the Caucasus. Its characteristics are repeated in even more abridged form by Grossheim in *Opred. Rast. Kavk.* [Key to the Plants of Caucasus] (1949, 452). The plant, that is the holotype of *A. sachokiana* was collected, as indicated on the label, in the Shemakha District, "between the Chevrarly pasture and Kurudag Mountain, July 28, 1928, M. Sakhokia" (A.A. Grossheim's herbarium, which is preserved in Tbilisi). Examination of this specimen allows us to suggest that, possibly, it is a cattle-grazed specimen of *A. dumetorum*, which, after grazing, produced a mass of new leaves and a single shortened stem with a capitulum (a second flowering in autumn) which frequently is observed in damaged herbaceous plants.

31. **A. jailensis** Zefir. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 251; N. Rubzov in Tr. Nikitsk. Bot. Sada, XXIX, 51.

Perennial. Stems numerous, erect or ascending, simple or weakly branched, finely lanate, 20–50 cm high. Leaves subglabrous above, lanate beneath, oblong, pinnately cut into 3–5 mm long segments, with lobes terminating into whitish cusp. Capitula solitary terminal on stems and their branches, large, 3–5 cm in dia. Involucral bracts sparsely pubescent, oblong-ovate, yellowish-green, with deeper greenish-gray vein, more or less brownish and fimbriate above along margin. Ligules white, 1.5 cm long. Receptacular scales oblong, with obtuse but drawn out, dark brown tip. Achenes compressed-tetraquetrous, curved, with finely and indistinctly serrate or entire, slightly oblique corona. Flowering June to August.

In meadows, on mountain peaks and in forest glades.—*European part*: Crimea. Endemic. Described from Crimea (Babugan-Yaila, mountain-steppe). Type in Leningrad.

32. **A. dumetorum** Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927) 160.—*A. dumentorum* var. *subtripinnata* Sosn. ex Grossh. Fl. Kavk. IV (1934) 118; Sosn. in Fl. Gruzii, VIII, 309.—*A. triumfettii* auct. non 48 All.: Ldb. Fl. Ross. II (1844–1846) 525 p. p.—*A. collina* var. *intermedia* Sosn. in Sosn. and Grossh. Opred. Rast. Tifl. (1920) 285, nom. nud.—Exs.: Pl. or. oxs. No. 274.

Perennial. Plants arachnoid, covered with appressed, but not very dense hairs, some grayish green. Stems numerous, about 30–40(60) cm high, erect, angular in cross section, not densely leafy, branched from middle and above, with erect unicapitulate branches, or stems simple, unicapitulate. Leaves green above, subglabrous, grayish beneath from appressed hairs, sessile, oblong-ovate, pinnately cut; segments oblong or lanceolate, or oblong-linear, in turn divided into short, lanceolate, serrate lobes and with sharply acute cusps, rachis narrow, with few teeth as on leaf lobes. Capitula long-pedunculate, 2.5–3.0 cm in dia. Bracts of sparsely hairy, involucre pale; outer bracts deltoid and obtuse, inner oblong, somewhat obtuse, with brownish, scarious, fimbriately truncate apex. Ligules oblong-spatulate, with almost entire, somewhat truncate apex. Receptacle hemispherical; scales oblong, narrow, carinate on outer side, terminating into very narrow cusp as long as or longer than florets. Flowering June to September (Plate III, Fig. 2).

In middle mountain zone.—*Caucasus*: All regions except Talysh Mountains. Described from Georgia (Tbilisi). Type in Tbilisi; numerous autotypes in Leningrad. Cf. Note 2 to *A. rescens* Willd.

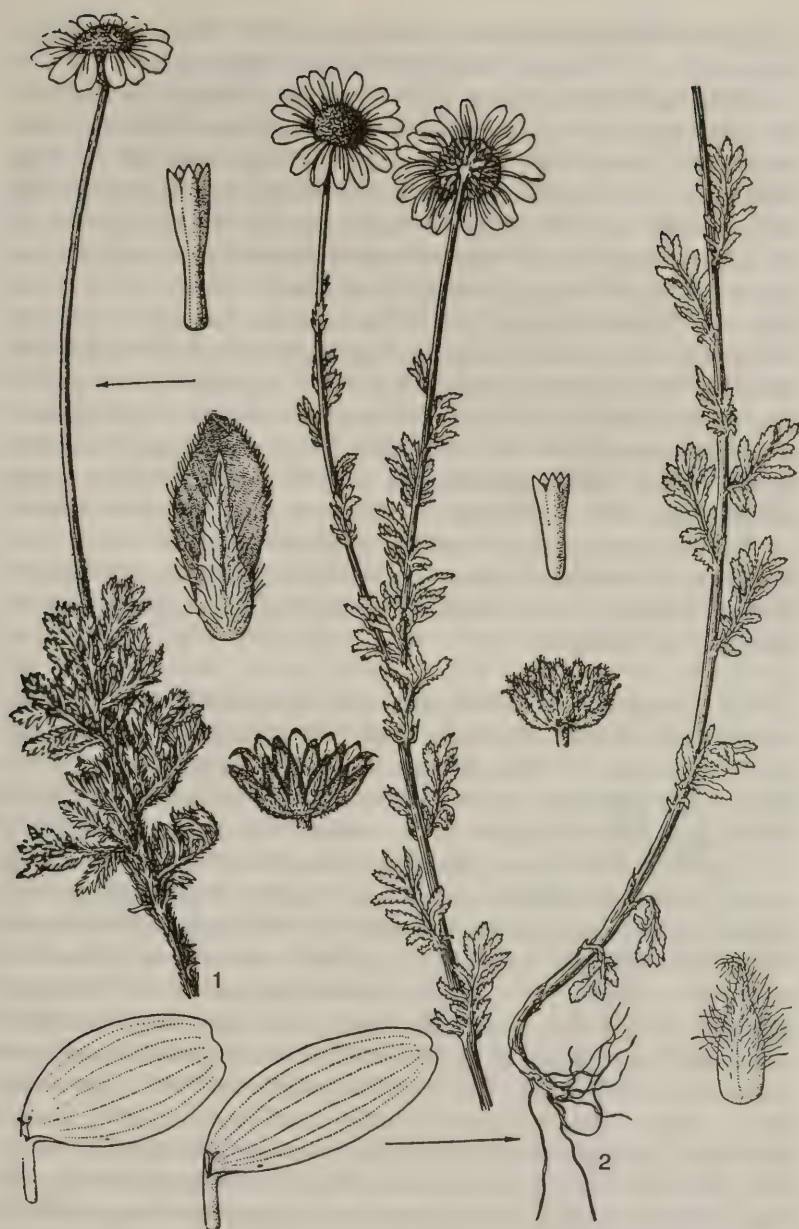


Plate III.

1—*Anthemis zyghia* Woron., habit, involucre, inner involucral bract, peripheral (ligulate) floret, and disk floret; 2—*A. dumetorum* Sosn., habit, involucre, involucral bract, peripheral (ligulate) floret, disk floret.

33. **A. linczevskyi** Fed. in Addenda, XXV, 868.—*A. rigescens* auct. non L.: B. Fedtsch. Rast. Turk. (1915) 735.

Perennial. Plant greenish, with woody root, sparsely covered with somewhat appressed hairs. Stems long, erect, slightly arcuate at base, erect above, longitudinally striate, unicapitulate, about 60 cm high, leafy from base to middle, leafless above, strong and virgate at fruiting. Basal leaves caducous; cauline leaves oblong, antrorse, pinnately divided into narrow-linear truncate-toothed segments; teeth and incisions pointing forward, unequal, sharply acute. Rachis narrow, more or less grooved. Capitula medium, 2.5–3.0 cm in dia; ligules white, scarcely shorter than disk, oblong-elliptical, narrowed toward both ends, with an apical notch or indistinctly 2–3 toothed. Involucre pubescent; all
51 bracts pale; outer bracts deltoid-lanceolate; inner oblong-lanceolate, somewhat obtuse, brownish and weakly fimbriate at apex. Receptacle hemispherical; scales stramineous, membranous or sharply acute. Achenes lilac, with rather broad corona. Flowering June to September.

On dry mountain slopes and among shrubs.—*Soviet Central Asia*: mountainous Turkmenia. Endemic. Described from Karakala District (Ioldere Ravine, on the slopes of Khasardag Mountain). Type and paratypes in Leningrad.

34. **A. dubia** Stev. in Bull. Soc. Nat. Mosc. XXIX, 4 (1856) 380; Trautv. in Tr. Peterb. Bot. Sada, VIII, 392; Schmalh. Fl. II, 61, tant. nom.; Zefirov in Izv. Krymsk. Otd. Geogr. Obshch. SSSR, 3, 39–44, in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI, 369–370, XVIII (1957) 251–253; N. Rubzov in Tr. Nikitsk. Bot. Sada, XXIX, 50.

Perennial. Roots strong, fusiform, thick. Stems usually numerous, simple or highly branched, ascending, arcuately or geniculately bent, about 25–30(40) cm long, unicapitulate or with unicapitulate branches, rather thick and, like leaves, grayish from rather dense pubescence, leafy up to 1/2–2/3 of its height. Leaves obovate, up to 3 cm long, pinnately divided into broadly linear, subobtuse, not strongly divergent, somewhat distant segments, in turn divided into slightly toothed acute lobes (cusps very small). Capitula medium, about 3.0–3.5 cm in dia; ligules white, somewhat acute, lacking apical teeth, slightly shorter than disk. Involucre lanate; outer bracts sharply deltoid, inner somewhat obtuse, oblong, with brownish membranous fimbria at tips, all pale, but with greenish midrib, particularly prominent in upper half of bract. Receptacular scales with slightly obtuse acumen. Flowering May to August.

On lawns, in oak forests, on sands and patchy turf slopes.—*European part*: Crimea (western part). Endemic. Described from

Crimea (near Simferopol and Alma, on marly hills). Type possibly in Helsinki. Isotypes apparently do not exist.

Note. This species could not have a more appropriate name, *A. dubia*, i.e., "dubious chamomile." In reality, big doubts remain as to which of the species of *Anthemis* actually occurring in Crimea the name proposed by Steven (l. c.) should apply. Nevertheless, in introducing this species now as a member of the Flora of the USSR, one can base it on the intuitive, probably correct conclusion of B.M. Zefirov (l. c.) that *A. dubia*, a quite widespread plant in Crimea, is taxonomically close not to *A. arvensis*, as considered evidently by Steven himself, but to *A. rigescens* and *A. dumetorum*. In any case, a chamomile is found in Crimea, which, on the basis of its small (but characteristic) distinctions, resembles the latter two species but, as a matter of fact, has a branched stem and habit somewhat resembling *A. arvensis*. If this plant can not be lumped with *A. dubia* Stev., then it
52 has to be considered a separate (and very good besides) new species.

Unfortunately, in the present case, Steven (l. c.) provided an unsatisfactory diagnosis of his *A. dubia*, and it is impossible, without having the type in hand, to get a clear idea of this species by reading the diagnosis. I consider it useful to provide a translation of the original diagnosis and notes made by Steven: "Leaves pubescent, pinnatipartite; lobes small, lanceolate, absolutely entire and slightly cuspidate; receptacle hemispherical; scales shorter than disk, lanceolate, with cusp, slightly shorter than scale and somewhat obtuse; achenes compressed-tetraquetrous, with membranous corona. Perennial. In habit (similar) to *A. arvensis*, but many stemmed for the most part, height up to 1 foot; with few unicapitulate branches, leafless over two-thirds (the length). Florets (ray) white, but of same size as in *A. arvensis*; disk (florets) yellow. Involucral bracts pale, lanate, with creamish midrib. Ligule equal (in length) to diameter of disk. Cusp of scales (receptacular) not acute, as in other (Crimean) species, but cylindrically rolled. Achenes almost the same as those in *A. rigescens*, which has conical receptacle. Because of presence of unique scales (receptacular), it cannot be included under any other (Crimean) species."

35. **A. woronowii** Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927) 162; Grossh. Fl. Kavk. IV, 117; Sosn. in Fl. Gruzii, VIII, 310.—*A. collina* Sosn. in sched. ad specim. typ.—*A. rigescens* var. *collina* Woron. in Sched. ad Herb. Fl. Ross. IV (1908) 48.—*A. triumfettii* auct. non All.: Ldb. Fl. Ross. III (1844–1846) 523 p. p.—*A. tinctoria* var. *rigescens* Schmalh. Fl. II (1897) 62 p. p. non *A. rigescens* Willd.—**Exs.:** GRF No. 1734 (sub *A. rigescens* var. *collina*).

Perennial. Plants appressed-hairy, grayish (especially stems). Stems erect, about 40–50(60) cm high; somewhat dichotomously branched above middle; branches unicapitulate. Leaves subglabrous above, but with small glandular hairs, appressed-hairy beneath, sessile, obovate, pectinately pinnately cut into short, oblong, approximate segments, with very short-lanceolate, entire lobes, terminating into corny cusps; rachis narrow, lacking teeth. Capitulum medium on rather long, leafless thin peduncles. Involucral bracts pale, dorsally flattened; outer bracts deltoid-lanceolate and acute, inner oblong, obtuse, narrow-scarious on margin, slightly brownish at apex. Ligules lanceolate-oblong, as long as disk, white. Receptacle hemispherical; scales oblong-lanceolate, abruptly narrowed into cusp, carinate dorsally, as long as disk florets or longer. Flowering June to August.

In lower forest zone, on herb-covered places.—*Caucasus*: Western Transcaucasia. Endemic. Described from Abkhazia (near Tsebelda). Type in Leningrad.

- 53 36. **A. talyschensis** Fed. in Addenda, XXV, 869.—*A. triumfettii* auct. non All.: Ldb. Fl. Ross. II (1844–1846) 525, quoad pl. talysch.

Perennial. Root woody, many-headed, covered at apex with dry remnants of leaf petioles; whole plant grayish-lanate. Stems ascending from curved base or erect, about 20–30 cm high, usually branched; branches unicapitulate, and some nonflowering, leafy up to lower 1/2, leafless above, about 20–30 cm high, with white-lanate short internodes. Leaves small, broadly ovate; all leaves sessile, divided into oblong-linear, toothed, approximate segments. Capitula solitary, medium, about 3–4 cm in dia; ligules white, oblong, narrowed toward both ends, inconspicuously 3-toothed at apex, as long as disk or slightly longer. Involucre pubescent; outer bracts deltoid, inner oblong-lanceolate; all bracts pale, scarious along margin and tip. Receptacle hemispherical; scales pale-brown, membranous, oblong, abruptly narrowed into acute brownish tip. Achenes obconical, brown with prominent ribs and indistinctly toothed corona. Flowering May to August, fruiting August.

In middle mountain zone.—*Caucasus*: Talysh. *General distribution*: Iran (Elburz Range). Described from Talysh Mountains (between the villages of Tuli and Dzthoni). Type and paratypes in Leningrad.

37. **A. euxina** Boiss. Fl. or. III (1875) 282; Trautv. in Tr. Peterb. Bot. Sada, VIII, 392; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3, 163; Grossh. Fl. Kavk. IV, 117; Sosn. in Fl. Gruzii, VIII, 310.—*A. rigescens* var. *ochroleuca* Somm. and Lev. Enum. pl. Cauc. (1900) 230.—*A. tinctoria* f. *floribus pallide luteis* var. *albidis* Alb. Prodr. Fl. Colch. (1895) 134.—**Exs.**: Pl. or. exs. No. 378.

- Triennial or perennial. Weakly pubescent plants with white curly hairs or subglabrous, slightly fleshy, and with many stems. Stems long, 40–50(60) cm, divaricate, ascending, in lower part somewhat woody, prostrate—usually creeping, weakly branched above. Leaves usually small, oblong, pinnately cut into 3–4 lobes (on each side); lobes short oblong-lanceolate, toothed, adjacent and almost fused at base; teeth sharply acute; subtending leaves small, subentire. Capitula medium, 2.0–2.5 cm in dia, long-pedunculate. Involucral bracts appressed-white-hairy, pale; outer bracts short-lanceolate, subacute, serrate, inner oblong-linear, obtuse; all bracts greenish, longitudinally striate on outside. Receptacle concave; scales carinate, abruptly narrowed into cusp slightly shorter than disk. Ligules white, oblong-linear, usually entire at apex.
- 54 Achenes small, compressed-triquetrous, with many stripes, terminating with short-truncate corona. Flowering June to August.

On coastal sands.—*Caucasus*: Western Transcaucasia (Black Sea Coast). *General distribution*: Balkans-Asia Minor. Described from Abkhazia (between Poti and St. Nicolas Bay). Type in Leningrad.

Series 3. Macroglossae Fed.—Involucral bracts with dark brown or blackish, usually wide border; ray (ligulate) florets white. Stems simple or sparingly branched. Leaves velutinous-tomentose, grayish, scabrous-hairy or subglabrous and green. Perennial plants.

38. **A. macroglossa** Somm. and Lev. in Nuov. Giorn. Bot. Ital. II, 2(1895) 85; ej. Enum. pl. Cauc. 230.—*A. platyglossa* auct. non C. Koch: Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3 (1927) 1927, p. max. p.; Grossh. Fl. Kavk. VI. 117; Sosn. in Fl. Gruzii, VIII, 307, p. max. p.

Perennial. Bright green, appressed-hairy or grayish plants. Stems erect, unicapitulate, about 40–50 cm high, somewhat thick, hollow. Leaves punctate-glandular, grayish-pubescent beneath, sessile, broadly ovate or almost orbicular, pinnately cut; segments lanceolate-elliptical, divided into linear, entire or pinnately toothed lobes with whitish cusps; rachis narrow, with isolated teeth on foliar lobes. Capitula rather long-pedunculate, large, up to 5–6 cm in dia. Involucral bracts carinate with brownish border; outer bracts deltoid, acute arachnoid-hairy outside, inner linear-oblong, subglabrous, attenuate into brown and scarious, fimbriate apex. Ligules elliptical-lanceolate, wide, somewhat acute, white. Receptacle hemispherical; scales linear, carinate, emarginate, abruptly narrowed into somewhat obtuse and extended tip, as long as disk. Achenes (immature) of disk florets triquetrous, compressed; outer achenes distinctly winged, with short, almost entire, corona. Flowering June to August.

In subalpine meadows.—*Caucasus*: Ciscaucasia (central), Western Transcaucasia (east). Endemic. Described from Central Caucasia (Svanetia, Latpari Range). Type in Florence.

Note. D.I. Sosnowsky (1927, l. c.) included *A. macroglossa* Somm. and Lev. with *A. platyglossa* C. Koch, described earlier from the Pontic Range in Turkey. Besides, Sosnowsky used the description by Sommier and Levier (l. c.) which pertains to *A. macroglossa*, but added a few words from the description given by C. Koch for *A. platyglossa*. However, there are insufficient grounds for lumping these species. *A. macroglossa* is unquestionably endemic to the Main Caucasus Range and is distributed essentially only in its central part. It is not really
55 known which race of this group actually grows in the Pontic Range. In any case it is absolutely impossible to guess which species Koch accepted as *A. platyglossa*. The diagnosis of this species, as was always the case with Koch, is totally unintelligible; the type is not designated (it only is stated: “*Auf pontischen Hochgebirge, 8–10.000' hoch. auf Urgestein*”), and now the specimen also has disappeared (perished in Berlin together with other authentic specimens remaining after Koch's death).

However, to facilitate possible future attempts to clarify the species described by Koch, at least in some indirect manner, we are providing a translation of the original diagnosis given by Koch for *A. platyglossa* [C. Koch in *Linnaea*, XXIII (1850) 319]: “Multi-cauline (plant), weakly sericeous from appressed hairs. Stems entirely unbranched, ascending, foot or more long, densely leafy below, leafless above, fistular. Leaves orbicular-oblong, bipinnate, lobes elliptical, sharply acute, 1–2-toothed. Involucre imbricate; bracts lanate, ovate-lanceolate. Capitula large, together with ligules 1.5–2 inch in dia; ligules broadly linear-oblong, pale yellowish, fertile. Achenes (immature) striate, with distinct unilateral corona. Scales (receptacular) oblong, abruptly narrowed into spiny cusp, equaling disk florets.”

Characteristic is Koch's remark that the stems of *A. platyglossa* are fistular (fistulosi). Is some sort of deformity being described by this term, for example, a case of fasciation of the common species *A. rigescens* Willd.? The most characteristic feature, typical for *A. macroglossa* Somm. and Lev., by which these species were identified (blackish border of involucre bracts) was not mentioned at all. Exactly such particularly large inflorescences can be found in fasciated plants.

39. *A. schischkiniana* Fed. in Addenda, XXV, 870.—*A. tinctoria* var. *bipinnatisecta* Trautv. in Tr. Bot. Sada, IV (1876) 319.—**Exs.**: Pl. orient. exs. No. 245 (sub *Anthemide platyglossa*), sp. typ.

Perennial. Plants sparsely whitish-pubescent, but green. Root woody. Stems few or solitary, uncapitulate, leafy from base to middle, leafless above, 50–60 cm high, erect from arcuate base, finely striate. Basal leaves absent (possibly caducous); cauline leaves broadly ovate, sessile, twice or thrice pinnately cut into segments with oblong-linear, acute, lobes with small cusps. Capitula medium, about 4 cm in dia. Involucre subglabrous; outer bracts oblong-deltoid, inner oblong-lanceolate, with brown scarious margin. Receptacle hemispherical; scales membranous, acute, much longer than disk. Ligules, white, oblong-broad lanceolate, narrowed toward both ends, indistinctly 2–3-
56 toothed or emarginate, somewhat yellowish when dry. Flowering July.

In subalpine zone.—*Caucasus*: Western Transcaucasia (south). Endemic. Described from dried specimens (l. c.) from western Georgia (Bakhamro). Type in Leningrad.

40. **A. abagensis** Fed. in Addenda, XXV, 869.

Perennial. Plants subglabrous or sparsely covered with whitish scabrous hairs, but bright green. Root brown, woody. Stems erect, uncapitulate, leafy up to middle, leafless above, with thin stripes, 40–50 cm high, arcuately bent at base. Basal leaves caducous; remaining cauline leaves sessile, broadly obovate, pinnately divided into broad elliptical pectinate and obtusely toothed segments, teeth terminating into very small corny cusps. Capitula medium, about 4–4.5 cm in dia. Outer bracts of almost glabrous or slightly hairy involucre oblong-deltoid, narrowly dark brown along margin; inner bracts oblong, yellowish green outside, broadly dark-brown or blackish along margin and apex, scarious and fimbriate. Receptacle hemispherical; scales membranous, pale, acute. Ligules white (somewhat yellowish on drying), oblong, slightly shorter than disk. Flowering June to August.

In subalpine meadows.—*Caucasus*: Western Transcaucasia. Endemic. Described from Caucasian Reserve (Abago Mountain). Type in Leningrad, paratype in Reserve's herbarium.

Note. Undoubtedly related to *A. zyghia* Woron. but at first glance differs by its bright-green, almost glabrous leaves or weak but scabrous (not soft and velutinous-tomentose and gray) pubescence.

41. **A. zyghia** Woron. in Izv. Kavk. Muz. XI (1917) 19; Sosn. in Vest. Tifl. Bot. Sada, Ser. 2, 3, 156 (diag. lat. compl. sub illegitima et mutata transcriptione "zygia"); Grossh. Fl. Kavk. IV, 117; Sosn. in Fl. Gruzii, VIII, 306.—*A. rigescens* var. *albo-tomentosa* C. Koch in Linnaea, XXXIII (1850) 317.—**lc.**: Kolak. Fl. Abkh. IV, Plate XXII (mediocr.).—**Exs.**: GRF No. 3245.

Perennial. Plants with many stems, entirely soft pubescent, ash-gray. Stems 30–40 cm high, simple. Leaves broadly ovate, pinnately cut, with lanceolate-ovate segments, divided into lanceolate or linear-lanceolate, acute, sometimes toothed-truncate, slightly decurrent, and pectinate-pinnate lobes; rachis with few teeth or incisions. Capitula solitary, on long peduncle, clavate below capitulum, hemispherical, 3–4 cm in dia. Receptacle hairy; bracts with wide brown border (usually
57 rusty on outside); outer bracts lanceolate, inner oblong-linear, obtuse or subobtus, indistinctly carinate on outside, somewhat rusty to scarious at apices and densely fimbriate, or rarely incised. Ligules white, almost as long as disk. Receptacular scales narrow-linear to lanceolate, terminating into apically brown and uncinat cusp, longer than disk florets. Flowering July to August. (Plate III, Fig. 1).

On limestone rocks, in mountains, at about 2,000–2,100 m.—*Caucasus*: Western Transcaucasia. Endemic. Described from Abkhazia (Pshitsa Mountains, cliffs and stony places). Type in Leningrad.

Note. D.I. Sosnowsky (l. c., 1927) was the first to change arbitrarily the spelling of the specific epithet “*zyghia*,” given by its author J.N. Woronow (l. c.), to “*zygia*”. But since the initial spelling of the epithet is grammatically correct, it should be used from now on despite the fact that all botanists (after Woronow) mentioning this species in one connection or another used Sosnowsky’s spelling.

The specific epithet “*zyghia*,” used by J.N. Woronow, corresponds to the ancient name of a locality in Abkhazia along the Bzyb River near Pshitsa. This region was also known as “Dzighetia.” Making an adjective from the word “*zigia*” for uniformity of nomenclature, we call this species the Zyghian chamomile.”

42. **A. melanoloma** Trautv. in Bull. Soc. Nat. Mosc. XLI, 2 (1868) 461, in Tr. Peterb. Bot. Sada, VIII, 392; Sosn. in Vestn. Tifl. Bot. Sada, Ser. 2, 3, 157, pro min. p.; Sosn. in Fl. Gruzii, VIII, 308, pro min. p.; Grossh. Fl. Kavk. IV, 117, pro min. p.—*A. tinctoria* var. *melanoloma* Trautv. in Tr. Bot. Sada, IV (1876) 377.—*A. rigescens* auct. non Willd.: Boiss. Fl. or. III (1875) 281, p. min. p.

Perennial. Stems erect, simple or with branches spreading from middle, to 40 cm high, slender, uncapitulate, appressed-pubescent, leafless in lower half. Basal leaves possibly caducous; cauline leaves elliptical, sessile, glabrous above, appressed-pubescent beneath, pinnately cut; segments erect, oblong-linear, pectinate-pinnate, divided into linear-lanceolate and entire lobes, terminating into cusps; rachis narrow-winged. Involucral bracts linear-lanceolate, subobtus or obtuse, appressed-pubescent, sometimes lanate on margin, with blackish membranous border, green in middle; inner bracts very finely incised-

fimbriate at apex. Receptacle ovoid-conical; scales linear, dense, longer or shorter than florets, gradually narrowed into somewhat strong cusp. Ligules oblong-linear. Corona conical, very short, brownish, membranous. Flowering June.

In subalpine zone.—*General distribution*: Balkans-Asia Minor (east). Possibly, found also in the Lesser Caucasus. Described from Saganlug Range in Turkey. Type in Leningrad.

58 **Note.** Study of the holotype of this species and comparison of it with others indicate that it has not yet been found in the Caucasus; other species partly overlap this species: *A. macroglossa* Somm. and Lev. and probably also *A. abagensis* m., in part.

At the time of Trautvetter, who described this species, the Saganlug Range (locus classicus) was within the limits of Turkey, then (until the October Revolution) Saganlug became the border range between Turkey and Russia. However, now again it is in Turkey (i.e., in Asia Minor). The comment of D.I. Sosnowsky (l. c., 1927) that "the occurrence of this species in Asia Minor has not yet been reported, but theoretically it is entirely possible," was apparently based on a misunderstanding.

The type specimen (holotype) was selected by Trautvetter from the collection of Lagovsky, who subsequently became notorious for the extreme confusion (or even very strange and inexplicable juggling) of the labels of his Caucasian and Ciscaucasian collections. As the label indicates, the authentic specimen originates from Saganlug Range, but it is not certain if the plant was collected in fact from this place.

Boissier annotated the type specimen as follows: ". . . mihi videtur *Anthemidis rigescentis forma involucris phyllis intensius nigrescentibus*." Despite this, it must be recognized that *A. melanoloma* is a very good species, because of not only its black-bordered involucre bracts but also its leaves which are deeply divided, with divergent segments, differing sharply from *A. rigescens* as well as all other species of this group. The author himself of this species, Trautvetter, of course, quite mistakenly referred his species to the *A. tinctoria* complex and later unnecessarily (perhaps under the influence of Boissier's authority) reduced his own species *A. melanoloma* to the rank of a variety.

Series 4. Altissimae Fed.—Involucre bracts monochromatic, pale; ligules white. Stems strongly branched, erect. Leaves green, pubescent; hairs erect; segments linear, pinnatifid. Annuals.

43. ***A. altissima*** L. Sp. pl. II (1753) 893; C. Koch in Linnaea, XXIII, 316; Boiss. Fl. or. III, 282; Schmalh. Fl. II, 61; Grossh. Fl. Kavk. IV, 118; Sosn. in Fl. Gruzii, VIII, 311; B. Fedtsch. Rast. Turk. 735; Fedtsch. and Fler. Fl. Evrop. Ross. 968.—*Chamdemelum cota*

C.A. Mey. Verzeichn. (1831) 75, non *A. cota* L.—*Cota altissima* J. Gay ex Guss. Fl. Sic. Syn. II (1842–1844) 867.—**lc.**: Rchb. Icon. t. 1008.

Annual. Plants sparsely pubescent or subglabrous with erect, tall, 30–40(60) cm long, strong and upright stem, branched above. Leaves ovate-oblong, 2–3 pinnately cut into short, lanceolate, acerate to acutely conical lobes; rachis slightly serrate. Peduncles of inflorescence clavate at blooming. Capitula large, 3.0–3.5 cm in dia. Outer involucre bracts 59 short-lanceolate, inner oblong, more scarious than outer. Receptacle hemispherical; scales oblong-lanceolate, truncate or with apical notch, abruptly narrowed into somewhat strong cusp as long as disk florets or larger. Ligules white, elliptical-linear, as long as disk. Achenes dark brown, compressed-tetraquetrous, slightly winged along margins, with 10 thin ribs on both sides and short apical border, but lacking corona. Flowering May to September.

In dry places, partly in ruderal conditions.—*European part*: Crimea; *Caucasus*: All regions; *Soviet Central Asia*: Kara-Kum (southwest); mountainous Turkmenia. Described from Mediterranean Region. Type in London.

44. ***A. coelopoda*** Boiss. Diagn. pl. or. II, 11 (1849) 12; Boiss. Fl. or. III, 283; Grossh. Fl. Kavk. IV, 118.—*Cota coelopoda* Boiss. Diagn. pl. or. II, 3 (1849) 21.

Annual. Plants weakly pubescent or subglabrous. Stems erect or divaricately branched below middle, about 40 cm high. Leaves ovate, twice pinnately cut into segments, in turn divided into very fine oblong-linear corny-tipped, highly divaricate lobes. Peduncles of inflorescence strongly clavate after flowering, fistular; capitula large, 3–4 cm in dia. Outer involucre bracts oblong-lanceolate, acute; inner obtuse. Receptacle hemispherical; scales oblong-linear, carinate, terminating into cusp. Ligules white, elliptical linear, as long as disk. Achenes compressed tetraquetrous, with indistinct vein on each side, or sometimes 3-veined, with acute apical border, but without corona.

In lower and middle mountain zones.—*Caucasus*: Talysh (reported by A.A. Grossheim from the Talysh Mountains, Zuvant). *General distribution*: Balkans-Asia Minor. Described from Asia Minor (Smyrna Plains, near Geir). Type in Geneva; isotype in Leningrad.

45. ***A. austriaca*** Jacq. Fl. Austr. Icon. et descr. V (1877–1878) 22; DC. Prodr. VI, 11, excl. var.: C. Koch in Linnaea, XVII, 44; Ldb. Fl. Ross. II, 525; Boiss. Fl. or. III, 284; Schmalh. Fl. II, 61; Fedtsch. and Fler. Fl. 968; Grossh. Fl. Kavk. IV, 118; Zefirov in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII, 254.—*A. hyrcana* Sosn. ex Grossh. Opređ. Rast. Kavk. (1949) 453, nom. nud.—*A. hyrcanica* Sosn.

(1947) in sched.—*A. zangelana* Sosn. ex Grossh. *Opred. Rast. Kavk.* (1949) 453, nom. nud.—*A. zangelanica* Sosn. (1947), in sched.—*Cota austriaca* J. Gay. ex Guss. *Fl. Sic. Syn. II* (1842–1844) 866.—**lc.**: Jacq. loc. cit. t. 444.

Annual. Plants grayish-pubescent. Stems erect, about (15)20–40(60) cm high, branched. Leaves oblong, pinnately cut into pectinate, linear segments with small, linear-oblong, acerate acute lobes; rachis toothed. Peduncles of inflorescence not clavate; capitula medium, 2.5–3.0 cm in dia. Involucre hispid; outer bracts lanceolate, inner linear-oblong rather narrow, scarious at tip. Receptacle conical; scales oblong, attenuate into short acumen, almost as long as disk. Ligules elliptical-linear, white, as long as disk. Achenes tetraquetrous, slightly compressed, with 3 indistinct grooves on each side, and short-toothed lobes of inconspicuous corona along upper margin. Flowering June to August.

In dry, somewhat weedy places.—*European part*: Crimea, Upper Dnieper, Upper Dniester, Bessarabia. *Caucasus*: Ciscaucasia, Eastern Transcaucasia (south), Talysh. *General distribution*: Central Europe. Described from Austria. Type in Vienna.

Note. The species *A. hyrcana* Sosn. ex Grossh. and *A. zangelana* Sosn. ex Grossh., inserted in A.A. Grossheim's (l. c.). *Opred. Rast. Kavk.*, apparently represent small specimens of *A. austriaca*. The characters by which these "species" are separated Grossheim's key (corona rudimentary, sometimes cylindrical, sometimes auriculate), possibly are the result of variation within the same species, i.e., *A. austriaca*. It is important to note that these "species" thus remained in the status "*nomina nuda*," and D.I. Sosnowsky himself did not try to describe them, leaving the names given to them only on the herbarium labels.

Series 5. Wiedemannianae Fed.—Involucral bracts with white border. Stems branched, sinuate. Leaves pinnate, weakly pubescent; hairs curly; leaf segments sharply toothed. Annuals.

46. ***A. wiedemanniana*** Fisch. and Mey. in *Ind. Sem. II* (1835) 27; DC. *Prodr. VI*, 10; Ldb. *Fl. Ross. II*, 523; Boiss. *Fl. or. III*, 286; Grossh. *Fl. Kavk. IV*, 118; Sosn. in *Fl. Gruzii, VIII*, 312.—*A. ormenioides* Boiss. *Diagn. pl. or. I*, 4 (1844) 5.—*Cota ormenioides* Boiss. *ibid. II*, 3 (1849) 21.

Annual. Plants grayish from curly and appressed hairs, 10–15 cm high. Stems numerous, short, branched from base. Leaves long- and narrow-linear, pectinately pinnately cut into deltoid, acicular, basally toothed lobes. Peduncles of inflorescences very short, thick. Involucre

compact and hispid; bracts oblong, white-bordered; outer bracts acute, inner somewhat obtuse. Receptacle conical; scales oblong-lanceolate, 63 carinate, somewhat obtuse and slightly truncate, mucronate. Ligules white, linear, truncate-3-toothed, shorter than disk. Achenes small, black, sharply tetraquetrous, compressed, punctate (under lens), with very short apical border in place of undeveloped corona. Flowering May to June.

On cultivated lands, ruderal and weedy places.—*Caucasus*: Western Transcaucasia (south). In the USSR, found only within the limits of Adzharia. Described from Asia Minor (mountains near Angora, near Safranbol and Mersivan). Type in Leningrad.

Section 4. Maruta (Cass.) Boiss. Fl. or. III (1875) 280.—Sect. *Euanthemis* DC. Prodr. VI (1837) 7 p. p.—*Maruta* Cass. in Dict. Sc. Nat. XXIX (1823) 174, pro gen.—Sect. *Cotula* Rupr. Fl. Ingr. (1860) 591, nom. absque diagn.—Achenes apically truncate, with or without distinct and sometimes many-toothed corona. Receptacular scales cuspidate or narrow-lanceolate. Annual herbs with finely divided pinnate leaves and usually branched stems.

Type of section: *A. cotula* L.

Series 1. Cotulae Fed.—Leaves twice pinnate, lobes, linear or filiform, numerous; stems usually tall, 15–30(40–60) cm high, strongly branched. Plants sparsely pubescent or subglabrous.

47. *A. cotula* L. Sp. pl. II (1753) 894; Rupr. Fl. Ingr. 591; C. Koch in Linnaea, XXIII, 315; Boiss. Fl. or. III, 315; Schmalh. Fl. II, 62, excl. var.; Fedtsch. and Fler. Fl. 969 p. p.; Krascheninn. Sorn. Rast. SSSR, IV, 223; Grossh. Fl. Kavk. IV, 116; Sosn. in Fl. Gruzii, VIII, 317; B. Fedtsch. Rast. Turk. 735.—*A. foetida* Lam. Fl. fr. II (1778) 164.—*Martua foetida* Cass. in Dict. Soc. Nat. XXIX (1823) 174.—*M. cotula* DC. Prodr. VI (1837) 13; Ldb. Fl. Ross. II, 526.—*M. vulgaris* Bluff and Fing. Fl. germ. II (1825–1833) 392.—*Chamaemelum cotula* All. Fl. Pedemont. (1785) 676.—*Cotula foetida* S.G. Gmel. Reise, I (1770–1784) 137.— *Ic.*: Rchb. Icon. t. 1000; Syreistsch. Fl. 261.— *Exs.*: Fl. Polon. Exs. No. 179; Herb. Fl. Ingriae, No. 310; Callier. Iter Taur. (1900) No. 629 (sub. *A. arv.*).

Annual. Plants scabrous from sparse hairs or almost glabrous. Stems cymosely branched, 15–20(30) cm high. Leaves ovate-oblong, twice pinnately cut into narrow-linear, entire or 2–3 toothed, short-acute, erect lobes. Peduncles of inflorescence not clavate. Involucral bracts oblong, obtuse, narrow-scarious along margin. Receptacle oblong-conical; scales absent in lower part, linear above and at tip, cuspidate,

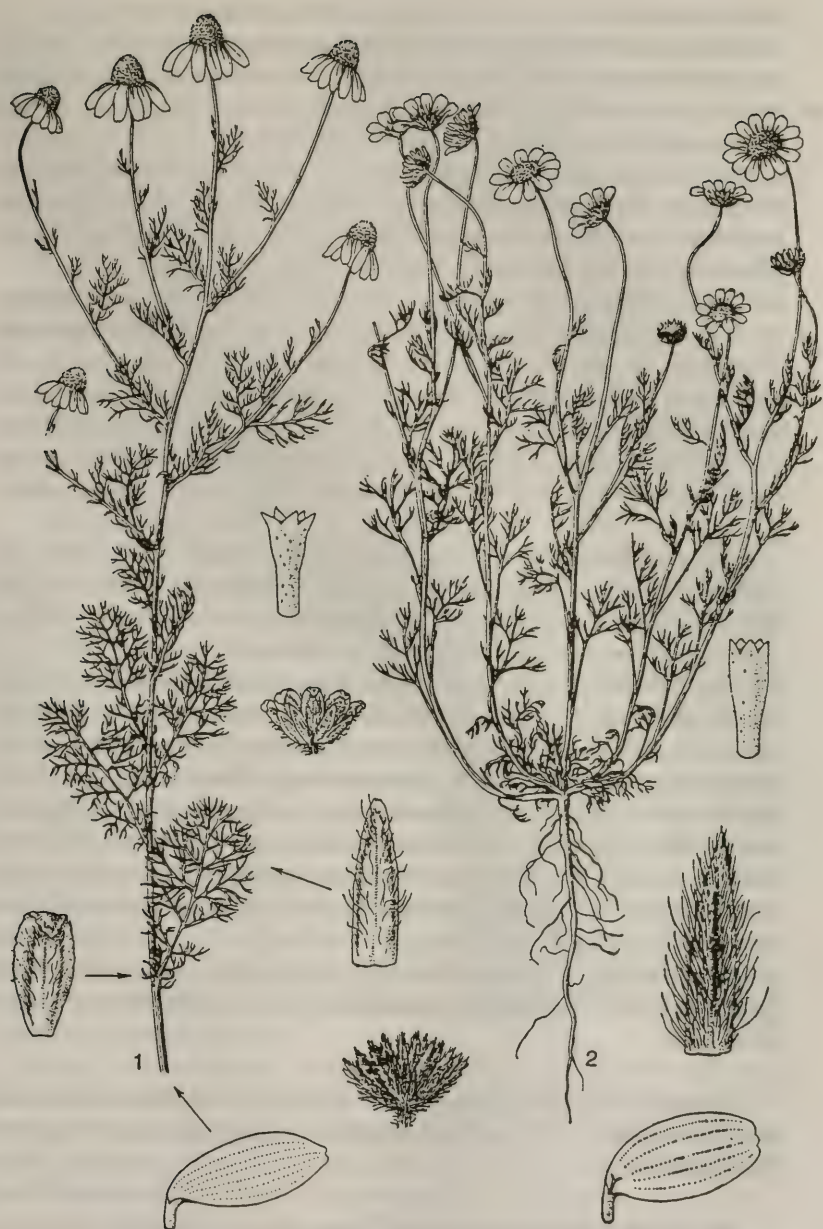


Plate IV.

1—*Anthemis cotula* L., habit; involucre; outer and inner involucre bracts; peripheral (ligulate) florets, disk florets; 2—*A. candidissima* Willd., habit; involucre; involucre bract, peripheral (ligulate) floret, disk floret.

not exceeding disk florets. Ligules oblong-elliptical and present in peripheral sterile florets; tubes of disk florets basally swollen. Achenes roundish in cross section, more or less finely tuberculate, lacking corona, 64 sunken, but usually slightly crenate from truncate ribs along margin. Flowering May to August. (Plate IV, Fig. 1).

In weedy places.—*European part*: All regions except north; *Caucasus*: All regions; *Soviet Central Asia*: Reported from extreme northwest. *General distribution*: Central Europe. Described from “weedy places of Europe, especially Ukraine.” Type in London.

Note. Based on the citation from *Species plantarum* of Linnaeus, the Ukrainian plants can, to a certain extent, be considered topotypes. Therefore, for the quite sharply isolated race growing more to the north and west and described from Lithuania (*A. lithuanica*), distinguishing itself as a separate species, there is a basis to call it by the name proposed by Besser, without doubting that the Linnaean type could be more similar to the northwestern race than to the southern.

48. **A. lithuanica** (DC.) Trautv. in Tr. Peterb. Bot. Sada, VII (1883) 392.—*A. lithuanica* Bess. ex DC. Prodr. VI (1837) 13, pro syn.—*A. cotula* β . *lithuanica* (DC.) Schmalh. Fl. II (1897) 62.—*Maruta cotula* β . *lithuanica* DC. ibid.; Ldb. Fl. Ross. II.

Annual. Stems strongly divergent, 50–60 cm high; internodes long. Plants glabrous or very sparsely pubescent. Leaves twice pinnately cut, ovate, sessile, divided into ovate segments, with very thin, hairy, oblong lobes. Capitula small, not more than 1.5 cm in dia; peripheral florets with ligule up to 5–6 mm long, as long as disk. Receptacle ovoid-conical; peduncles of inflorescences not clavate. Involucral bracts oblong, somewhat obtuse, scarious along margin. Receptacular scales linear, shorter than florets. Achenes roundish in cross section, lacking corona. Flowering May to July.

On borders of fields, in weedy places.—*European part*: Upper Dnieper (north). Endemic? Described from Lithuania. Type in Leningrad.

Series 2. Odontostephanae Fed.—Leaves pinnate, lobes very small, few. Stems short, 5–10 cm high, slender, simple or sparingly branched. Plants pubescent.

49. **A. odontostephana** Boiss. Diagn. pl. or. I, 6 (1845) 85; Boiss. Fl. or. III, 319; B. Fedtsch. Rast. Turk. 735.

Annual. Plants short, 5–10 cm high, ash-gray-pubescent. Stems usually numerous, thin, simple or weakly branched in lower part. Leaves rather small, petiolate, ovate, pinnately cut into 2–3 somewhat acute,

3–5 lobed segments, or segments very small. Peduncles of inflorescences on terminal branches, long, clavate at apex. Capitula small, few-flowered. Involucre compact, hispid; bracts oblong, obtuse, brownish-scarious at apex. Ligules of peripheral pistillate florets oblong, slightly longer than disk. Receptacle short-conical; scales few, setosely pointed. Achenes terete, ribbed; outer achenes tuberculate-scabrous, with truncate apex and 10–15 divergent teeth of indistinctly developed corona; inner achenes usually almost smooth, with unilateral short-toothed corona.

In dry places, in middle mountain zone.—*Soviet Central Asia*: mountainous Turkmenia (Greater Balkans). Described from Iran (Persepolis Ruins). Type in Geneva; isotype in Leningrad.

Series 3. Microcephalae Fed.—Leaves simple, linear or pinnate, but with fewer lobes. Stems short, filiform, 5–10 cm high, simple or weakly branched. Plants almost wholly glabrous.

50. **A. microcephala** (Schrenk.) B. Fedtsch. in Rast. Turk. (1915) 735; Pavlov, Fl. Tsent. Kazakhst. III, 238.—*Maruta microcephala* Schrenk in Ind. Sem. Horti. Petrop. X (1845) 53; *ibid.*, XI, 77; Trautv. in Tr. Peterb. Bot. Sada, VIII, 393; *ej.* in Bull. Soc. Nat. Mosk. II, 39; O. and B. Fedtsch. Perech. Rast. Turk. IV, 180.

Annual. Plants small, usually not more than 10 cm high, but reaching 20 cm or more in cultivation (in botanical gardens), almost entirely glabrous, with very thin, sometimes almost filiform stem (to 1 mm in dia in cultivation), divaricately branched almost from base, sparsely leafy, with leafless long peduncles of inflorescences terminal on stem branches. Leaves sessile, pinnatisect, cuneate-ovate; segments narrow, linear, lobate or palmatipartite. Capitula very small, 0.3–0.5 cm in dia; peripheral (ligulate) florets with small, 2-toothed, almost linear, white limb. Receptacle ovoid-conical, covered with somewhat setaceous, small scales. Achenes very small, brownish, roundish, slightly winged and finely sulcate, very indistinctly tuberculate, lacking corona. Flowering June to August.

In dry, sandy and silty soils, dry stream beds, floodplains of rivers, near irrigation channels, and in steppes (as a spring ephemeral).—*Soviet Central Asia*: Lake Balkhash Region, Aralo-Caspian Region (east). Endemic. Described from Dzhungaria (“in mountain valleys of the Maibshalyrgan”). Type and isotypes in Leningrad.

51. **A. deserticola** Krasch. and M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. I, 1 (1938) 178; Zakirov, in Tr. Uzb. Univ. Nov. Ser. No. 89 (1957) 147.

Annual. Plants glabrous. Stems 10–12 cm high, roundish in cross section, longitudinally striate, simple or branched; branches long, uncapitulate, filiform, but slightly clavate below inflorescence. Leaves 66 somewhat fleshy, entire, narrow-linear, 1–3 cm long, 1–2 mm wide, obtuse, sometimes twice or thrice pinnately cut or irregularly pinnately cut, with narrow-linear lobes. Capitula solitary, small, 3–5 mm in dia. Involucre imbricate; outer bracts lanceolate, narrow-scarious, inner ovate, obtuse, apically membranous. Ligules white, oblong, without apical border, 2 mm long. Receptacle obtusely conical; scales acuminate. Achenes slightly curved, obconical, 1 mm long, with 4–5 white, slightly winged ribs, truncate apex, and short corona incised on margin. Flowering April.

Sandy deserts and saline soils.—*Soviet Central Asia*: Kyzyl-Kum. Endemic. Described from Kazakhstan (Kyzyl-Kum Sands between Turd-Kuduk and Kutun). Type and paratype (Uzbekistan, “Hungry Steppe”) in Leningrad.

GENUS 1514. *Chamaemelum* Mill.^{1,2}

Mill. Gard. Dict. Abridg. ed. 4 (1754); Adans. Fam. II (1763) 128; Cass. in Dict. Sc. Nat. XXIX (1823) 179, 185, non Vis. 1845.

Capitula on rather long erect peduncles, solitary on apices of main stem and its branches, but usually many on a single plant, heterogamous, with rather numerous peripheral pistillate ligulate florets, in one row (in cultivated forms, often in several rows), and with numerous bisexual, tubular disk florets, or homogamous, with only bisexual tubular disk florets. Involucre broadly scutellate, 6–12 mm in dia and 3–6 mm long; bracts herbaceous, with wide, light colored, membranous border appendiculately broadened at apex, imbricate in 3–4 irregular rows, with inconspicuous midrib; outer bracts lanceolate, with narrower membranous border; inner bracts oblong and oblong-linear 1.5–2 times as long. Receptacle slightly convex, obtusely conical, 2–2.5 times as long as wide, fistular, punctate-alveolate, squamose; scales oblong-linear, obtuse, with appendiculately broadened, light colored, membranous border at apex. Corolla of ligulate florets (sometimes present) white; ligules linear-oblong, 7–14 mm long, with punctate glandular hairs below, decurved after anthesis; tube about 2.5 mm long, strongly flattened dorsally, almost like wing with more or less

¹Treatment by N.N. Tzvelev.

²From the Greek words: *Chamai*—small, and *melon*—apple; the smell of the capitula of the species of this genus distinctly resembles that of a ripe apple.

distinct, downward directed appendages at base, covering ovary apex; corolla of tubular florets yellow 1.8–2.5 mm long, with 5 deltoid, curved teeth; corolla tube, densely covered with punctate glandular hairs, gradually broadened toward throat and base, with thickened scale on lower side, more or less covering ovary apex by downward directed
 67 appendages. Filaments rather long, glabrous, anthers without distinct basal appendages, but with lanceolate-ovate-obtuse apical appendages. Style bifid; branches narrow-linear, truncate. Achenes 1.2–1.5 mm long, about 0.6 mm in dia, prismatically cylindrical, narrowed toward base, glabrous, with 3(4) prominent veins, lacking pappus. Perennial herbs, strongly aromatic with more or less branched, erect or ascending stems. Leaves alternate; laminae 2–3-pinnatisect in very narrow lobes.

A few (2–3) species of this genus are distributed mainly in Southern Europe and North Africa; one species is widely cultivated as a medicinal and ornamental plant and often grows wild.

Type of genus: *Chamaemelum nobile* (L.) All.

Note. Following R. Visiani, *Osserv. Matric.* 1845, p. 12 and *Fl. dalmat.* II, 1847, p. 84, the generic name *Chamaemelum* has been wrongly used in many botanical works up to the present time for a large group of species belonging to the genus *Tripleurospermum* Sch. Bip. However, the species *Anthemis nobilis* L., which has a whole series of significant differences from other *Anthemis* L. species, undoubtedly should be considered the type species of the genus *Chamaemelum*, established by Tournefort and subsequently restored by Miller and Adanson; as a result, we also are adopting the generic name *Chamaemelum* for it.

C. nobile (L.) All. Fl. Pedem. I (1785) 185.—*Anthemis nobilis* L. Sp. pl. (1753) 894; DC. Prodr. VI, 6; Schmalh. Fl. II, 60; Taliev, Opred. Vyssh. Rast. (1907) 486; Fedtsch. and Fler. Fl. Evorp. Ross. III, 968.—**Ic.** Komarov, Sbor. Sushka i Razved. Lekarstv. Rast. Izd. 3 (1917) Plate 34; Hegi, Ill. Fl. VI, 1 (1918) 536, f. 272; Zemlinsky, Lekarstv. Rast. SSSR (1951) 435.

Perennial. Plants 10–30 cm high, strongly aromatic, usually strongly branched from base, grayish-green from rather long, simple, sparse, appressed hairs. Stem erect or ascending, more or less branched, densely leafy. Leaves, except lowermost, sessile, but always with small lateral lobes near distinctly broadened base; lamina twice or thrice pinnately cut, 1–6 cm long and 4–15 mm wide, oblong or linear-oblong, apical lobes very narrow, linear or lanceolate-subulate, with rather long cartilaginous cusp. Capitula solitary at apices of stem and branches. Involucre 6–12 mm in dia and 3–6 mm long; bracts with wide, light colored, membranous border. Ligulate florets numerous, white; disk

florets tubular, yellow. Achenes 1.2–1.5 mm long and about 6 mm wide with 3(4) prominent veins, lacking pappus. Flowering July to September.

Cultivated as a medicinal and ornamental plant and now and then found in fields, by roadsides, as an escaped or naturalized plant.—
68 *European part*: Baltic Region, Upper Dnieper, Upper Dniester, Middle Dnieper, Bessarabia, Black Sea Region, Crimea. *General distribution*: Atlantic Europe, Central Europe, Mediterranean Region, Balkans. Introduced into other regions. Described from Southern Europe. Type in London (Kew Botanical Garden).

Economic Importance. Long used as a medicinal plant. The blooming capitula are used for this purpose, the medicinal effect of which is very similar to that of medicinal chamomile (*Matricaria recutita* L.) but, according to S.E. Zemlinsky (op. cit.), stronger; also cultivated as an ornamental plant (usually the “double flowered” forms with tubular florets more or less modified into ligulate ones).

GENUS 1515. *Anacyclus* L.^{1,2}

L. Sp. pl. (1753) 892.

Capitula many-flowered; outer florets ligulate, pistillate, with short-winged tube; other florets tubular, bisexual, 5-toothed, very rarely all florets tubular; achenes smooth, compressed, at least outer with wide transparent wings on both sides, extended above into auricles; involucre membranous; receptacle with bracts. Annual herbs.

1. Peduncles not thickened; petals yellow; corolla tubes of all florets (especially outer) setose-ciliate; bracts oblanceolate, as long as corolla tubes; achenes subglobose or obovoid 1. ***A. ciliatus*** Trautv.
- + Peduncles thickened; petals white above, reddish below; corolla tubes of all florets glabrous, bracts cuneate-obovate, shorter than corolla tubes; achenes deltoid-obovoid 2. ***A. officinarum*** Hayne

1. ***A. ciliatus*** Trautv. in Bull. Soc. Nat. Mosc. XLI, 2, (1868) 461; Grossh. Fl. Kavk. IV, 121.—*Anthemis ciliata* (Trautv.) Boiss. Fl. or. III (1875) 312.

Annual. Stem branched, flexuous, velutinous, 30–50 cm high. Leaves weakly pubescent or glabrous, oblong, twice or thrice pinnately

¹Treatment by C.S. Afanasiev.

²From the Greek words: *anai*—without, and *cyclos*—circle; named for sterile outer ligulate florets, which are only pistillate.

cut into thin, narrow-linear, short-cuspidate, divergent, 3–7 mm-long lobes. Capitula 1.0–1.5 cm in dia, solitary at apices of main stem and branches, on long, not thick, short-villous peduncles. Involucre short pilose; bracts oblong, outer acute, inner somewhat obtuse with narrow white-membranous margin. Receptacles hemispherical; scales membranous, oblanceolate, subacute, as long as corolla tubes. Outer
69 florets pistillate, yellow, with oblong-elliptical ligules, 7–10 mm long and setose-ciliate tubes; disk florets bisexual, tubular, with more or less setose hairy tubes. Achenes subglobose or obovoid, 3–4 mm long and 2.5–3.0 mm in dia, flat, with wide transparent wings, extended above in more or less globos auricles in outer achenes. Flowering June to July.

Along edges on dry slopes in lower mountain zone.—*Caucasus*: Eastern Transcaucasia. Endemic. Described from Georgia. Type in Leningrad.

2. **A. officinarum** Hayne Artzn. Gew. IX (1825) 46; Ldb. Fl. Ross. II, 2, 527; Schmalh. II, 63; Stankov Opred. Rast. Evrop. Ch. 625.—*A. puncher* Bess. ex DC. Prodr. VI (1837) 16.—**lc.**: Hayne, op. cit. t. 46; Hegi, Ill. Fl. VI, 2, fig. 382.

Annual. Stem erect or ascending, branched, weakly hairy, sometimes almost glabrous in lower part, to 40 cm high. Leaves weakly pubescent, oblong, twice pinnately cut into more or less sparse, entire, 2–3-fid, acute, linear, and linear-subulate, divergent, 4–10 mm long lobes. Capitula about 1 cm in dia, solitary at apices of main stem and branches, on long, thickened, short pilose peduncles. Involucre hemispherical, short-pilose; bracts oblong, with white-membranous margin; outer bracts acute, inner somewhat obtuse. Receptacle convex, with membranous cuneate-obovate, short cuspidate scales, shorter than corolla tubes. Outer florets with elliptical ligules, 8–13 mm long, sometimes absent (var. *discoidea*), white above and reddish below; disk florets bisexual, tubular, lemon-yellow, corolla tubes of all florets glabrous. Achenes flat, deltoid-obovate, 2.5–3.0 mm long and 2.0–2.5 mm in dia, with wide wings extended above into broadly deltoid auricles in outer achenes, much narrower and lacking auricles in inner achenes. Flowering July to August.

Reported (in the literature) as a wild plant (escaped from botanical gardens, where it is sometimes cultivated) from Podolia (vicinity of Kremenets), and from the Volyn and Poltava regions.—*General distribution*: Cultivated on a small scale in Bohemia and Thuringia. Described from Germany from cultivated specimens. Type in Berlin.

Economic Importance. A medicinal plant. Its root (*Radix pyrethri germanici* s. *communis*. Die Deutsche Bertramwurzel) containing

essential oil is used. In German folk medicine it is used as an analgesic for toothaches, for diseases of the tongue, as a sialogogue and an external stimulant. Its action is similar to that of the root of *A. pyrethrum* DC. (*Radix purethree romani*) used in Austrian pharmacopeia, which contains inulin, essential oil, and alkaloids—pyrethrin and pellitorin, only its action is slightly stronger.

- 70 **Note.** Besides *A. officinarum* Hayne, other *Anacyclus* species are also sometimes cultivated in botanical gardens, as for example, *A. pyrethrum* DC., *A. clavatus* Pers. (= *A. tomentosus* DC.) and a few others. Apparently, the Schmalhausen's report (*Flora*, II, 63) on the occurrence of *A. tomentosus* DC. in Crimea (Sevastopol) refers to cultivated specimens.

GENUS 1516. *Achillea* L.^{1,2}

L. Sp. pl. (1753) 896.

Capitula small, many-flowered, in corymbs, less often solitary. Involucre oblong, ovoid, oblong-cylindrical, turbinate or hemispherical; involucre bracts imbricate, with white-membranous, yellow, or brown-membranous margin. Receptacle flat, convex, conical or very rarely long-cylindrical, with membranous scales, as long as tubular florets or much shorter. Outer florets pistillate, usually 1-seriate, 5–23, ligulate; ligules white, pink, red, or yellow, small, 1/6–1/2 as long as involucre, equal or larger, sometimes deformed, less often absent; disk florets bisexual, tubular, 5-toothed, corolla tube compressed, with more or less swollen base, covering ovary apex. Achenes compressed dorsally, oblong, cuneate, rarely oblong-obovoid, or oblanceolate, lacking or with somewhat thick spongy wing, apically truncate, lacking pappus or corona. Perennial herbs, sometimes woody at stem base, with entire, pinnately lobed, pinnately cut, or pinnately parted leaves.

Type of genus: *A. millefolium* L.

The genus *Achilles* includes more than 20 species, distributed almost exclusively in the temperate zone of the Old World, mainly in the mountains and in the Mediterranean Region.

- | | | |
|----|---|-----|
| 1. | Achenes wingless | 1. |
| + | Achenes winged; wing somewhat thick, spongy | 26. |

¹Treatment by C.S. Afanasiev; section *Ptarmica* (DC.) Koch by V.P. Botschantzev.

²The name of the plant used by ancient authors originated from Achilles, hero of the Trojan War.

2. Leaves narrow-linear, with very small, 1–2(3) mm long, transverse, imbricate segments 22.
- + Leaves wider; segments larger, neither transverse nor imbricate 3.
3. Plants entirely glabrous 17. **A. glaberrima** Klok.
- + Plant more or less pubescent 4.
4. Leaves pectinate 15. **A. ochroleuca** Ehrh.
- + Leaves pinnately cut or pinnately parted, but not pectinate 5.
5. Ligules white, pink, or red 6.
- + Ligules yellow or golden 15.
6. Leaf segments wide, ovate, sharply toothed 12. **A. latiloba** Ldb.
- + Leaf segments otherwise 7.
7. Rhizome short, many-headed, plants lacking underground shoots; leaf segments linear 1. **A. nobilis** L.
- + Rhizome branched, plants with underground shoots; leaf segments not linear, broader 8.
8. Rachis of cauline leaves always with intermediate (between basal segments) lobes or teeth 9.
- + Rachis of cauline leaves lacking intermediate lobes, sometimes with only isolated teeth 10.
9. Rachis of leaves 1.0–2.5(4.0) mm wide, with incised-toothed lobes or teeth throughout length; lobes of segments broadly lanceolate or lanceolate, 0.8–2.0 mm wide; involucre usually 2.5–3.0 mm in dia; ligule 2.5–3.0 mm wide 10. **A. distans** Waldst. and Kit.
- + Rachis 1.0–1.5(2.0) mm wide, with pinnately parted or entire intermediate lobes from middle or almost from base; lobes of segments lanceolate, 0.3–1.0 mm wide; involucre usually 3.0–3.5 mm in dia; ligules 2.0–2.4 mm wide 11. **A. stricta** Schleich.
10. Rachis of leaves 1–2 mm wide; lobes of leaf segments 0.5–1.5 mm wide 3. **A. millefolium** L.
- + Rachis 0.5–1.0 mm wide; lobes of leaf segments narrower, 0.1–0.6 mm wide 11.
11. Rhizome thick, woody, many-headed. Plants densely lanate-villous 9. **A. bucharica** Winkl.
- + Rhizome slender, not woody; pubescence different 12.
12. Rachis of leaves about 1 mm wide; leaf segments somewhat distant; involucre bracts with wide dark reddish-brown or reddish-brown membranous border 4. **A. sudetica** Opiz.
- + Rachis 0.5–1.0 mm wide; leaf segments approximate, membranous border of involucre bracts not wide, usually light colored 13.
13. Ligules pink, red, or very rarely white 8. **A. asiatica** Serg.
- + Ligules yellowish-white or white 14.

14. Lobes of leaf segments lanceolate or linear-lanceolate, up to 0.5–0.6 mm wide; involucre oblong, (2.0)2.5–3.0 mm in dia; ligules 1.5–2.0 mm long and 1.5–2.5 mm wide 6. **A. pannonica** Scheele.
- + Lobes of leaf segments linear-setose, linear, less often linear-lanceolate or lanceolate, usually 0.1–0.2 mm wide; involucre ovate-cylindrical, less often oblong, 1.5–2.5(3.0) mm in dia; ligules 0.9–1.5 mm long and 1–2 mm wide 7. **A. setacea** Waldst. and Kit.
15. Plants tall, up to 120 cm high; middle cauline leaves broad oblong-lanceolate, 8–18 cm long; involucre oblong-obconical 13. **A. filipendulina** Lam.
- + Plants small; cauline leaves narrower, 2–6 cm long; involucre of different shape 16.
16. Whole plant densely sericeous-tomentose; capitula on thick (from pubescence) peduncles, in very dense, strongly convex, often hemispherical corymbs 14. **A. coarctata** Poir.
- + Pubescence different; peduncles not thick; corymbs less dense and convex 17.
17. Rachis of leaves in upper half with intermediate teeth between basal segments 18.
- + Rachis lacking intermediate teeth 19.
18. Leaf segments linear; capitula in dense corymbs; ligules 1.0–1.5 mm long; achenes cuneate-oblong, 1.1–1.2 mm long. Plants growing in Transcaucasia and Crimea 2. **A. neilreichii** Kern.
- + Leaf segments oblong; capitula in somewhat lax corymbs; ligules 0.8–0.9 mm long; achenes oblong, about 1.5 mm long. Plants growing in the south of Ukraine 21. **A. micranthoides** Klok.
19. Middle cauline leaves petiolate. Arenicolous plants 18. **A. micrantha** Willd.
- + Middle cauline leaves sessile. Steppe and mountainous plants....20.
20. Stem divaricately branched from base, very rarely simple. Involucre more or less hemispherical 16. **A. leptophylla** MB.
- + Stem simple or sometimes weakly branched above. Involucre oblong or ovoid 21.
21. Lobes of leaf segments not cuneate, linear, oblong-linear, less often lanceolate; capitula on shorter peduncles in dense corymbs; ligules golden or bright yellow 19. **A. biebersteinii** Afan.
- + Lobes of leaf segments linear-cuneate; capitula on more or less peduncles in lax corymbs; ligules light yellow 20. **A. cuneatiloba** Boiss. and Buhse.
22. Stem sulcate-ribbed; lobes of leaf segments almost cylindrical; involucral bracts weakly pubescent to more or less glabrous 25. **A. tenuifolia** Lam.

- + Stem cylindrical; lobes of leaf segments more or less flat, not cylindrical; involucre bracts more or less densely pubescent 23.
- 23. Involucre (4)5–6 mm in dia, hemispherical or subglobose 24. **A. vermicularis** Trin.
- + Involucre narrower, different in shape 24.
- 24. Involucre ovoid-cylindrical, 3–4 mm in dia leaf segments 0.5–1.0 mm long 26. **A. schischkini** Sosn.
- + Involucre obovoid, 2–3 mm in dia; leaf segments 1.0–1.5(2.0) mm long 25.
- 25. Involucre appressed-hairy, 2.5–3.0(3.5) mm long; stem appressed-hairy, finely tomentose; leaf segments more or less glabrous, usually approximate, with rotund-obovate or obovate, toothed lobes 22. **A. wilhelmsii** C. Koch.
- + Involucre somewhat sparsely tomentose, 3.0–3.5(4.5) mm long; stem and leaves more or less densely pubescent; leaf segments somewhat distant, with narrower, spatulate or oblong-obovate, prickly-toothed lobes 23. **A. kermanica** Gand.
- 26. Leaves entire 27.
- + Leaves pinnately lobed, pinnately parted or pinnately cut 38.
- 27. Leaves punctate-glandular hairy on both sides (glandular hairs in depressions) 28.
- + Leaves not punctate-glandular-hairy; if glandular-hairy, then hairs not in depressions 30.
- 28. Involucre bracts densely pubescent, yellowish-green in middle, with yellow membranous margin, or margin yellow with narrow dark brown border 35. **A. salicifolia** Bess.
- + Involucre bracts sparsely pubescent, green in middle with dark brown membranous border 29.
- 29. Leaves grayish-green, densely crisped-hairy, involute. Transcaucasia 36. **A. sedelmeyeriana** Sosn.
- + Leaves flat, green, less densely crisped-hairy. European Part, north of Soviet Central Asia, Siberia 37. **A. cartilaginea** Ldb.
- 30. Cauline leaves semiamplexicaul, obtuse. Carpathians..... 27. **A. lingulata** Waldst. and Kit.
- + Cauline leaves sessile, not amplexicaul, acute 31.
- 74 31. Leaves covered with short, crisped hairs..... 38. **A. septentrionalis** (Serg.) Botsch.
- + Leaves glabrous or covered with long straight hairs 32.
- 32. Plants grayish-green from dense pubescence..... 29. **A. griseo-virens** Alb.
- + Plants green, glabrous or with scattered hairs 33.

33. Plants entirely glabrous; stem branched, all branches terminating in capitula. Transcaucasia 33. **A. sachokiana** Sosn.
 + Plants pubescent; stem simple, branched only in inflorescence; if branched, then axillary branches sterile 34.
34. Leaves hairy (at least beneath, and along veins above) with rubiginous, long, straight hairs. Caucasus 28. **A. biserrata** MB.
 + Leaves glabrous, or with colorless, shorter hairs 35.
35. Stem branched, axillary branches sterile, long. Caucasus 32. **A. ptarmicifolia** (Willd.) Rupr. ex Heimerl
 + Stem simple, branched only in inflorescence; if branched in other part also, then axillary branches sterile and short 36.
36. Involucral bracts green in middle, with wide yellowish membranous margin, or membranous part yellow, but with narrow dark brown border; receptacular scales yellow at apex; ligulate florets white. Eastern Siberia, Far East 31. **A. acuminata** (Ldb.) Sch. Bip.
 + Involucral bracts green in middle, with dark brown membranous margin; receptacular scales dark brown at apex; ligulate florets white or white with violet stripe 37.
37. Rhizome short; leaves lanceolate. Kamchatka, Commander and Kuril islands 34. **A. macrocephala** Rupr.
 + Rhizome creeping, leaves linear or linear-lanceolate. European Part 30. **A. ptarmica** L.
38. Capitula solitary; leaves twice or thrice pinnately cut. Carpathians 45. **A. schuri** Sch. Bip.
 + Capitula in corymbose; leaves pinnately lobed, pinnately parted, or pinnately cut, sometimes twice pinnately parted, or twice or thrice pinnately cut 39.
39. Leaves thrice pinnately cut; secondary lobes entire 5. **A. borealis** Bong.
 + Leaves pinnately lobed, pinnately parted and pinnately cut to twice pinnately part or twice pinnately cut; all lobes and segments inequally serrate-dentate 40.
40. Membranous part of involucral bracts dark-brown 41.
 + Membranous part of involucral bracts yellow or yellow with dark brown border 43.
- 75 41. Leaves punctate-glandular hairy above. Far East, Kamchatka 44. **A. camtschatica** Rupr. ex Heimerl
 + Leaves not punctate-glandular hairy 42.
42. Lowermost leaf segments with 1–2 large teeth or lobes on each side besides small teeth. Mainly plant of plains, sometimes extending into mountains 39. **A. impatiens** L.

- + Lowermost leaf segments, with 1 large tooth along upper margin (besides small teeth), or lacking large tooth but only with similar small teeth. Subalpine or alpine plants..... 40. **A. ledebouri** Heimerl
- 43. Leaves pinnately cut; upper leaf segments with equal small teeth, sometimes some segments also with 1 large tooth or lobe along upper margin; lower segments, always with 1–2 large teeth or lobes on each side besides small teeth 39. **A. impatiens** L.
- + Leaves pinnately lobed, pinnately parted, or pinnately cut, but then their segments unequally toothed or pinnately lobed, pinnately parted, or pinnately cut, with large number of secondary lobes or segments 44.
- 44. Capitula large (up to 7.5 mm long and 7 mm in dia), hemispherical; ligules large (up to 3.5 mm long and 3.5 mm wide), white or pink 42. **A. japonica** Heimerl
- + Capitula smaller, semiovoid or oblong; ligules smaller or weakly developed, white 45.
- 45. Leaves pinnately cut (often twice pinnately cut), densely punctate-glandular hairy; capitula oblong; membranous part of involucre bract yellow or yellow with narrow dark brown border; florets covered with capitate glandular hairs; ligules exceeding disk or somewhat undeveloped (in subtubular flowers) and not exerted from them, with larger teeth at apex 43. **A. ptarmicoides** Maxim.
- + Leaves pinnatilobate or pinnately parted (sometimes twice-pinnately lobed or twice-pinnately parted), not punctate-glandular hairy or with few such hairs; capitula semiovoid; membranous part of involucre bracts yellow with wider dark brown border; capitate glandular hairs on florets very few or lacking; ligules exceeding disk, with small apical teeth 41. **A. alpina** L.

Section 1. Millefoliatae DC. Prodr. VI (1837) 24.—*Millefolium*
 76 C. Koch, Syn. Fl. Germ. (1837) 372.—Ligules white, pink, red or light yellow; leaves pinnately cut or pinnately parted, segments neither transverse nor imbricate.

1. **A. nobilis** L. Sp. pl. (1753) 899 and (1763) 1268; MB. Fl. taur.-cauc. II, 339 p. p.; DC. Prodr. VI, 26 p. p.; Ldb. Fl. Ross. II, 2, 533 p. p.; Boiss. Fl. or. III, 257 excl. β . *ochroleuca*; Schmalh. Fl. II, 65, excl. β . *ochroleuca*; O. and B. Fedtsch. Perech. Rast. Turk. IV, 181; Grossh. Fl. Kavk. IV, 124; Kryl. Fl. Zap. Sib. XI, 2725.—*A. odorata* Pall. Reise, I (1774) 379, II, 103 and III, 556, non L.—*A. corymbifera* S. Gmelin, Reise, I (1774) 137.—*Ic.*: S. Gmelin, Reise, I,

tab. XXV, f. 1; Rchb. Ic. Fl. Germ. XVI, f. 1024, II; Syreistsch. III. Fl. Mosk. Gub. III, fig. on page 264; Javorka and Csapody, Iconogr. Fl. Hung. f. 3731 s, f.—Exs.: GRF No. 1069; Fl. pol. exs. No. 644a, b; Fl. Ital. exs. No. 1778.

Perennial. Rhizome short, many-headed; plants grayish-green, more or less densely lanate-flocculose, sometimes subglabrous; stems few, 3–6, less often up to 12, or solitary, (15)25–35(50) cm high, erect or slightly ascending, usually sinuate, simple or branched near top, usually densely leafy, finely sulcate, weakly angular and more strongly pubescent below. Leaves ovate or oblong-elliptical, twice pinnately cut, punctate-alveolate on both sides, somewhat antrorse, flat, (2)3–6 cm long, sessile, only lower cauline leaves and those on nonflowering branches petiolate; midrib of leaves narrow, with more or less frequent intermediate cuspidate lobes between middle part and apex (between main segments), lanceolate, deltoid or linear, entire or pinnatifid; leaf segments linear, up to 10–15 mm long, few, distant (especially in lower part of lower cauline leaves), divergent, pinnately cut into entire or often pinnatifid lobes, with small, 0.5–1.0(2.0) mm long, lanceolate or linear, acute lobes, terminating in cartilaginous cusp. Capitula in dense, convex, compound corymbs; receptacle more or less convex, often conical at fruiting. Involucre ovoid, less often oblong-ovoid, 2.0–3.0(3.5) mm long, 1.5–2.0(2.5) mm in dia; involucre bracts pale, carinate, oblong, with narrow white or less often brown (var. *marginata* C. Koch) membranous margin; bracts membranous, lanceolate, white, transparent, slightly shorter than tubular florets. Ligules of outer florets white or yellowish-white, reniform-rotund, subelliptical or semicircular, truncate at apex, unequal 3-toothed, (0.6)1.0–1.6(1.9) mm wide, 1/3–2/7 as long as involucre. Achenes oblong, about 1 mm long. Flowering June to September.

In steppe and forest-steppe zones on chernozems and saline soils, solonchets, chalky and stony outcrops, in feathergrass and sheep's fescue steppes, steppe meadows, old fields, by roadsides, more rarely in thickets of shrubs, along forest edges and in glades, as well as in riverine meadows. In forest and desert zones as an introduced and weed plant, often on railway embankments and in vacant lots and squares in cities.—*European part*: Volga-Dnieper, Bessarabia, Middle Dnieper, Black Sea Region, Crimea, Volga-Don, Lower Don, Trans-Volga Region, Volga-Kama (south); *Caucasus*: Ciscaucasia, Dagestan, Western Transcaucasia; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Soviet Central Asia*: Aralo-Caspian, Lake Balkhash Region (north). As an introduced plant in Karelia-Lapland, Ladoga-Ilmen, Eastern Transcaucasia, mountainous Turkmenia, Syr-Darya, Tien Shan. *General distribution*: Atlantic and Central Europe, western Mediterranean

Region (north), Balkans. Described from Central Europe. Type in London.

Note 1. Varies markedly in the division of leaf segments, degree of pubescence and other characters; hybridizes with *A. neilreichii* Kern., *A. leptophylla* MB., *A. biebersteinii* Afan., *A. setacea* Waldst. and Kit., *A. millefolium* L. s. l. and a few other species of this genus.

Note 2. E. Boissier (op. cit. p. 256) reports the distribution of *A. odorata* Koch in the Caucasus "between Vladikavkaz and Alagir (Rupr.!)". Following Boissier, this species was also reported for the Caucasus by Trautvetter (*Tr. Peterb. Bot. Sada*, VIII, 2, p. 451). The plant collected by Ruprecht in October 1860, between Vladikavkaz and Alagir and identified by Boissier as *A. odorata* Koch, is preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR. This plant differs from *A. odorata* Koch by dentate and not entire lobes of the leaf segments and by narrower capitula. Apparently, it is a hybrid between *A. nobilis* L. \times *A. setacea* Waldst. and Kit.

2. *A. neilreichii* Kern. in Oest. Bot. Zeitschr. XXI (1871) 141; Afan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX, 363.—*A. ochroleuca* auct. fl. Ross. non Ehrh.: Grossh. Fl. kavk. IV, 124.—*A. nobilis* auct., p. p.: MB. Fl. taur.-cauc. II, 339; Ldb. Fl. Ross. II, 2, 533.—*A. nobilis* var. *neilreichii* (Kern.) Beck. Fl. Nied. Oest. (1890) 1198; Hayek in Hegi, Ill. Fl. VI, 2, 567 (subvar.).—*A. nobilis* β . *ochroleuca* Boiss. Fl. or. III, 257, non *A. ochroleuca* Ehrh. Schmalh. Fl. II, 65.— **Ic.**: Mag. Bot. Lapok, XII, tab. VI, f. la, b, c; Javorka and Csapody, Iconogr. Fl. Hung. f. 3731s.— **Exs.**: Fl. Hung. exs. No. 578; Fl. exs. Austro-Hung. No. 997; Fl. Bohem. et Morav. exs. No. 574; Fl. exs. Reip. Bohem. Sloven. No. 1184.

Perennial. Rhizome short, branched; plants grayish-green, usually densely lanate-floccose; stems few, usually 2–4 or solitary, (20)25–50 cm high, erect or slightly ascending, straight or weakly flexuous stem, simple or branched above, more or less sparsely leafy, finely sulcate, cylindrical, often more weakly pubescent and sometimes almost glabrous below, weakly angular, and strongly pubescent above. Leaves oblong-elliptical, less often ovate, twice pinnately cut, punctate-alveolate on both sides, somewhat antrorse, flat, 3–7 cm long, sessile, only lower cauline leaves and leaves on nonflowering branches petiolate; midrib narrow, usually with distant, cuspidate lobes (between large basal segments) from middle to apex; lobes lanceolate or linear, entire or 78 pinnatifid; leaf segments linear, 15(20) mm long, few, distant (especially in lower part of lower cauline leaves), divergent, pinnately cut into entire or pinnatifid lobes, with small, 0.5–1.5(2.0) mm long, linear, oblong-linear or lanceolate, subacute lobes, often terminating into very

short cartilaginous cusp. Capitula in dense, convex, compound corymbs. Receptacle conical, less often somewhat convex, sometimes oblong-conical at fruiting. Involucre oblong-ovoid, less often ovoid, 3.0–3.5 mm long and about 2 mm in dia; involucre bracts pale, carinate, oblong, with narrow, brownish or brown, less often white membranous border. Receptacular bracts membranous, lanceolate, white, transparent, slightly shorter than tubular florets. Ligules of outer florets light yellow, semicircular, subelliptical or rotund-reniform, truncate at apex, unequally obtusely 3-toothed, less often almost entire, (1.0)1.4–2.0 mm wide, 1.0–1.5 mm long. Achenes 1.1–1.2 mm long, cuneate-oblong. Flowering June to August.

Along open stony and stony-clayey slopes of mountains and hills in the foothills, as also on stony outcrops, in shrub thickets, along forest edges, thin forests and roadsides.—*European part*: Crimea (mountains); *Caucasus*: Eastern and Southern Transcaucasia. *General distribution*: Central Europe, Balkans-Asia Minor. Described from Austria. Type in Vienna.

Note. It is a yellow-flowered mountain race of *A. nobilis* L. group, related to the latter; it is well distinguished from it by the yellow-colored ligules of the outer florets. Other characters: larger and narrower capitula, larger ligules, less acuminate lobes of the leaf segments, fewer, more distant, intermediate teeth of midrib, slightly larger achenes, etc., are not always clearly expressed, and are also found sometimes in *A. nobilis* L. in one or another combinations. Intermediate forms, apparently partly of hybrid origin, are also found at places of contact between the ranges of these two races.

It hybridizes with *A. coarctata* Poir. (*A. dobrogensis* Prod.) and a few other species.

3. *A. millefolium* L. Sp. pl. (1753) 899; MB. Fl. taur.-cauc. II, 338; Dc. Prodr. VI, 24, p. p.; Ldb. Fl. Ross. II, 2, 531 p. p.; Boiss. Fl. or. III, 255 excl. *β. lanata*; Schmalh. Fl. II, 64 p. p.; O. and B. Fedtsch. Perech. Rast. Turk. IV, 181 p. p.; Grossh. Fl. Kavk. IV, 124; Kom. and Alis. Opred. Rast. Dal'nevost. Kr. II, 1027; Sugawara, Ill. Fl. Saghal. IV, 1735 excl. synonymo; Kryl. Fl. Zap. Sib. XI, 2721.—*A. millefolium* subsp. *millefolium* (L.) Hayek in Hegi, Ill. Fl. VI, 2, 569.—*A. millefolium* subsp. *eu-millefolium* (L.) Hayek Prodr. Fl. Balcan. 639; Szafer, Kulcz., Pawl. Rosl. Polskie, 684 (forma typ.).—*A. millefolium* var. *macrophylla* Serg. in Kryl. op. cit. 2722.—*A. magna* auct. fl. Ross. non L.—*A. ossica* C. Koch, in Linnaea, XXIV (1851) 323 sec. Boiss. l. c.; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2, 45.—*A. subhirsuta* Gilib. Fl. Lithuan III (1831) 217.—*Millefolium officinale* and *M. vulgare* Gleditsch. Reise. II (1791) 39, 166, etc.—**Ic.**: Syreistsch.

III. Fl. Mosk. Gub. III, Fig. on p. 264; Fedtsch. and Fler. Fl. Evrop. Ross. Fig. 970; Kom Sbor. Sushka i Razved. Dek. Rast., 3rd ed., Fig. 39.—**Exs.:** Fl. exs. Austro-Hung. No. 988; Fl. Bohem. et Morav. exs. No. 1281; Fl. exs. Bohem. Sloven. No. 941; Pl. Finn. exs. No. 338; Eest. taimed. No. 135; Fl. pol. exs. No. 642; fl. Lithuan exs. No. 100.

Perennial. Rhizome slender, creeping, branched; whole plant more or less covered with fine white hairs; stems few or solitary, usually weakly pubescent (finely floccose), (5)20–60(120) cm high, erect or ascending from base, erect, less often flexuous, simple or branched above, cylindrical, finely sulcate, with short leafy branches in axils of upper and middle cauline leaves. Leaves lanceolate, oblong-lanceolate, or almost linear, punctate-alveolate, twice or thrice pinnately cut, with numerous more or less remote segments (1.5–10.0 mm apart); lower cauline leaves and leaves of nonflowering branches 10–40 cm long, 0.8–5.0 cm wide, rachis 1–2 mm wide, leaves usually in upper part with solitary teeth between basal segments; lobes and teeth lanceolate, less often linear, 0.5–1.5 mm long, 0.3–0.4(0.5) mm wide, terminating in short cartilagenous cusp. Capitula in numerous, unequal, compound corymbs, 2–15 cm in dia. Involucre oblong to almost ovoid, 3–4(6) mm long, (2)3–4(5) mm in dia; involucre bracts green, carinate, with prominent midrib, membranous along margin, often brownish; bracts ovate to oblong-elliptical, membranous, floccose above, with scattered hairs on dorsal surface. Ligules of outer florets white, pink, or red. (1)2–4 mm long, 1.5–3.0(4.5) mm wide, more or less rotund, 2–3-toothed at apex, limb a half as long as involucre; tubular florets up to 20, glandular-hairy on outside. Flowering July to October.

In forest, forest-steppe and steppe zones in dry-bottom forest-meadows, in steppe meadows and meadow-covered mountain slopes, in open thin forests, on deposits, along borders of fields, in wastelands and along roads.—*European part:* All regions; *Caucasus:* All regions, except Talysh; *Western Siberia:* Ob River Area, Irtysh, Upper Tobol, Altai, *Eastern Siberia:* Angara-Sayans, Yenisei, Dauria, Lena-Kolyma; *Far East:* Introduced in Kamchatka, Sakhalin, Ussuri; *Soviet Central Asia:* In the north of Aralo-Caspian Region, Lake Balkhash Region, Tien Shan, introduced in the southern mountains and in oases. *General distribution:* Scandinavia, Atlantic, Central and Southern Europe, Mediterranean Region, Balkans-Asia Minor, Iran, Dzhungaria-Kashgaria, Mongolia, introduced to other continents. Described from Western Europe. Type in London.

Note. A highly polymorphic species, strongly variable in size, degree of pubescence, division of leaves, size and shape of capitula, shape and size of ligules of outer florets, etc. There are many forms of varying taxonomic significance, usually vaguely delineated from

each other. Their correct assessment is possible only through detailed study in nature and a monographic study of all members of section *Millefoliatae*. In this context we are refraining from distinguishing and describing individual races, even those like *A. magna* auct. Fl. Ross., and we present here as separate races, only a few which are already included in a flora, for example, *A. sudetica* Opiz. and *A. pannonica* Scheele. It hybridizes with *A. distans* W. and K., *A. stricta* Schleich., *A. biebersteinii* Afan. and other species.

4. ***A. sudetica*** Opiz. in Andre, Hesperus (1812) and in Flora, V (1822) 635; Szafer, Kulcz. Pawl. Rosl. Lolskie, ed. I, 624; Klok. in Vizn. Rosl. URSR, 543.—*A. millefolium* var. *alpestris* Vimm. and Grab. Fl. Sil. II (1829) 169; Koch, Syn. Fl. Germ. ed. I, 373.—*A. millefolium* subsp. *sudetica* (Opiz.) Weiss in Koch, Syn. Fl. Germ. ed. III, II (1902) 1404; Hayek in Hegi, Ill. Fl. VI, 2, 571 Szafer, Kulcz. Pawl. op. cit. ed. II, 684.—**lc.**: Javorka and Csapody, Iconogr. Fl. Hung. f. 3739.—**Exs.**: Fl. exs. Austro-Hung. No. 989; Pl. Pol. exs. No. 174.

Perennial. Rhizome slender, creeping; plants weakly pubescent with fine white hairs; stems solitary or few, erect or ascending from base, 18–40 cm high, simple or weakly branched above, erect or slightly flexuous, cylindrical, finely sulcate. Leaves light green, lanceolate or oblong-lanceolate, midrib about 1 mm wide, entire or less often with isolated teeth between main segments; middle and upper cauline leaves sessile, upward directed 5–7(9) cm long, 1–2 cm wide, thrice pinnately cut; segments slightly distant, pinnately cut into linear-lanceolate, acute, entire or subentire, up to 0.5 mm-wide lobes terminating into short cartilaginous cusp, lowermost segments semi-amplexicaul (auricles); lower cauline leaves and leaves of nonflowering branches petiolate, larger, latter up to 25–30 cm long and 3(6) cm wide, with linear lobes. Capitula in compact, unequal, dense, convex compound corymbs, sometimes almost globose on flowering. Receptacle conical. Involucre oblong, (4)5–6 mm long, (2.0)2.5–3.0 mm in dia; involucre bracts more or less pubescent, greenish, with wide dark brown border, weakly carinate; outer bracts oblong-ovate or oblong, others oblong-lanceolate, with prominent yellowish vein on dorsal surface; bracts membranous, slightly shorter than tubular florets, dark brown at apex and along margin in upper part, sparsely white-hairy along margin on outside. Ligules of outer florets white or pink, (2.0)2.5–3.5 mm long, subelliptical or semicircular, truncate at apex, obtusely 3-toothed. Flowering VII–IX.

81 In alpine and subalpine meadows, stony and sandy places, less often in beech forests.—*European part*: Upper Dniester. *General distribution*: Alps, Sudeten, Carpathians. Described from Central Europe. Type in Prague?

Note. Extremely variable in the degree of pubescence of the stem and leaf, as well as in the intensity of the color of the involucre bracts.

5. *A. borealis* Bong. in Mém. Acad. Sc. St.-Pétersb. ser. 6, II (1832) 149; Torr. a. Gray, Fl. N. Americ. II, 409; Rydb. in N. Americ. Fl. 34, 220; Hulten, Fl. Kamtch. IV, 166.—*A. millefolium* auct. non L.: Less. in Linnaea, VI (1831) 167; Bongard, op. cit. 148.—*A. millefolium* β. *occidentalis* DC. Prodr. VI (1837) 24; Ldb. Fl. Ross. II, 2, 532; Herder in Bull. Soc. Nat. Mosc. XXXVIII, 2, 404.—? *A. anethifolia* Fisch. in herb.; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2, 450.—*Ptarmica borealis* DC. l. c. 21; Ldb. l. c. 527.

Perennial. Rhizome short, creeping; stems solitary, less often few, 17–27(45) cm high, erect or ascending from base, straight or weakly flexuous, simple, strong, thicker, usually more than 2.5 mm in dia, sulcate, cylindrical below, weakly angular above. Leaves thrice pinnately cut, oblong-lanceolate or oblong-linear, more or less densely pubescent; midrib entire, 0.7–1.0 mm wide; segments numerous, somewhat distant, middle and upper cauline leaves sessile, 4–8 cm long and 0.6–1.0(1.5) cm wide, lower leaves and leaves of non-flowering branches petiolate, latter 12–15(20) cm long and to 2 cm wide; segments twice pinnately cut into lanceolate-linear or linear lobes, 1.5–3.0 mm long and 0.2–0.4 mm wide, terminating into short cartilaginous cusp. Capitula on densely villous peduncles, in dense, many-flowered, compound unequal corymbs. Involucre ovoid, (4)5–6 mm long and about 3 mm in dia, usually densely villous-pubescent; involucre bracts light colored, yellowish-green, carinate, with thick prominent midrib and wide dark-brown membranous border; outer bracts ovate, others oblong-ovate; bracts membranous, oblong-lanceolate, acute, mostly brownish at apex. Ligules white, from roundish-obovate to subelliptical, (2.5)3.0–4.0(4.5) mm long and about 2.5 mm wide, indistinctly obtuse 3-toothed at apex or almost entire. Achenes about 2.5 mm long, oblong or oblong-cuneate. Flowering June to August.

Far East: Kamchatka, Kuril Islands. *General distribution:* Aleutian Islands, Alaska, northern Canada. Described from Sitka Island. The type ought to be in Leningrad.

Note. Only two specimens of *A. borealis* Bong., collected from the USSR, are preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, one with the label "Petropawlowsk. Dr. Mertens" and the other with "Igir 1833." Besides, one more milfoil specimen, collected by Merck on the Kuril Islands, is also preserved
82 there with Fischer's identification "*anethifolia* m.," which is possibly the type of this species, named but not described by Fischer. This plant, like some of the specimens from Sitka Island, differs from *A.*

borealis Bong. in the shape and division of the leaves, weak pubescence and other characters. Further study is required to solve the question of whether *A. anethifolia* Fisch. in herb. is a separate species or should be considered a synonym of *A. borealis* Bong., as suggested by some botanists.

6. **A. pannonica** Scheele in Linnaea, XVIII (1844) 471; Szafer, Kulcz. Pawl. Rosl. Polskie, ed. I, 624; Klok. in Vizn. Rosl. URSR, 544.—*A. millefolium* ssp. *pannonica* (Scheele) Hayek in Hegi, Ill. Fl. VI, 2, 571; Szafer, Kulcz. Pawl. Rosl. Polskie, ed. II, 684.—*A. millefolium* γ. *lanata* Koch, Syn. Fl. Germ. ed. I (1837) 373.—*A. millefolium* var. *setacea* Ldb. Fl. Ross. II (1845–1846) 532, p. min. p.; Schmalh. Fl. II, 64, p. p.—**lc.**: Javorka and Csapody, Iconogr. Fl. Hung. f. 3740.—**Exs.**: Fl. exs. Austro-Hung. No. 992; Fl. Hung. exs. No. 575; Dörfler, Herb, Norm. No. 4540; Fl. Bohem. et Morav. exs. No. 798; Fl. Polon. exs. No. 47.

Perennial. Rhizome slender, creeping, branched; plants more or less densely covered with long, fine, white hairs; stems solitary or few, grayish, usually lanate-villous in lower part, less often turning red, (15)25–50(70) cm high, erect or ascending from base, straight or weakly flexuous, simple, cylindrical, finely sulcate, sometimes with short and densely leafy branches in axils of middle and upper cauline leaves. Leaves twice pinnately cut, linear-oblong or linear-lanceolate, often grayish from especially dense pubescence along midrib in lower part, 0.5–1.0 mm wide; middle and upper cauline leaves up to 8 cm long and 1 cm wide, with numerous approximate segments, pinnately cut into linear-lanceolate or lanceolate up to 0.5–0.6 mm wide lobes, terminating into cartilaginous cusp, lower segments larger, semiamplexicaul (auricles); lower cauline leaves long-petiolate, up to 12 cm long, 1.5–2 cm wide, leaves of nonflowering branches up to 35 cm long and 2 cm wide. Capitula in dense, compact, unequal corymbs. Receptacle conical. Involucre oblong, 4–5 mm long, (2)2.5–3 mm in dia; involucre bracts hairy, light colored, greenish-yellowish, weakly carinate, with prominent midrib and narrow, usually light brown membranous border; outer bracts oblong-ovate, others oblong or lanceolate-oblong; bracts membranous, whitish, oblong-lanceolate, slightly shorter than tubular florets, with fine hairs on outside, mainly in upper part. Ligules of outer florets yellowish-white or white, 1.5–2.0 mm long, 1.5–2.5 mm wide, rotund-reniform or semicircular, less often subelliptical, apically truncate, obtusely toothed. Flowering June to August.

In steppes and forest-steppes, on herb and stony slopes of ravines, hills, and mountains, by roadsides, in vineyards.—*European part*:

- 83 Upper Dniester, Bessarabia, Black Sea Region. *General distribution:* Central Europe. Described from Hungary (vicinity of Pesta). Type in Vienna.

Note. The species is close to *A. setacea* Waldst. and Kit., from which it differs mainly by the broader lobes of the leaf segments and the larger involucre and ligules.

It hybridizes with *Chrysanthemum millefoliatum* L. (*Chrysanthemoachillea carmen-sylvae* Prod. Fl. Rom. 1000) and some species of the genus *Achillea*.

7. *A. setacea* Waldst. and Kit. Pl. rar. Hung. I (1802) 82; Willd. Sp. pl. III, 3, 2212; MB. Fl. taur.-cauc. II, 338; DC. Prodr. VI, 25; Boiss. Fl. or. III, 256; Hayek in Hegi, Ill. Fl. VI, 2, 573; Grossh. Fl. Kavk. IV, 124; Kryl. Fl. Zap. Sib. XI, 2275; Klok. in Vizn. Rosl. URSR, 1544; Szafer, Kulcz. Pawl. Rosl. Polskie. ed. II, 684.—*A. millefolium* var. *setacea* (Waldst. and Kit.) Koch, Syn. Fl. Germ. ed. I (1837) 373; Ldb. Fl. Ross. II, 2, 532, p. p.; Schmalh. Fl. II, 64 p. p.; Weiss in Koch, Syn. Fl. Germ. ed. III, 2, 1404 (subsp.); O. and B. Fedtsch. Perech. Rast. Turk. IV, 181; Majeovsky, Fl. ed. 8, 578.—*A. odorata* α. Willd. Tract. de Achilleis (1789) 42.—*A. odorata* Rchb. Fl. exs. (1830) 229, non L.—? *A. mollis* Andr. in Rogovicz, Obozrenie (1869) 302, nom. nud.; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2, 451.—**Ic.:** Walldst. and Kit. loc. cit. tab. 80; Rchb. Ic. Fl. Germ. XVI, f. 1028; Hegi, loc. cit. tab. 294 a, b, c; Javorka and Csapody, Iconogr. Fl. Hung. f. 3737f; Fl. Yugo-Vost. Fig. 677.—**Exs.:** GRF No. 3987; Rchb. Fl. Germ. exs. No. 43; Fl. exs. Austro-Hung. No. 993; Fl. Hung. exs. No. 81; Fl. Bohem. et Morav. exs. No. 1162; Fl. exs. Reip. Bohem. Sloven. No. 939, I-V.

Perennial. Rhizome slender, creeping, branched; stems less numerous, less often solitary, grayish or grayish-green from fine, long, intertwined, white hairs, usually lanate-vilous below, (10)20–35(70) cm high, erect or ascending from base, straight, sometimes weakly flexuous, simple or rarely weakly branched above, cylindrical, finely sulcate often with short leafy branches in axils of middle and upper cauline leaves. Leaves twice or thrice pinnately cut, linear-lanceolate, less often linear-oblong, grayish or grayish-green, less often gray, usually densely pubescent, especially in lower part of narrow (0.5–0.75 mm wide) midrib; leaves of nonflowering branches petiolate, 5–8 cm, less often to 35 cm long and 0.5–0.7(1.6) cm wide; lower cauline leaves petiolate or subsessile, 6–10(15) cm long and 0.4–1.0 cm wide; middle and upper leaves sessile, 1.5–5.0(10.0) cm long, 0.2–0.8(1.0–1.5) cm wide; leaf segments numerous, antrorse, usually approximate, often 1.0–1.5 mm apart, less often to 3 mm; segments of middle cauline

84 leaves 2–4(9) mm long and 2–5 mm wide, usually longer at base of middle and upper leaves, semiamplexicaul (auricles), gradually reduced and remote in leaves of nonflowering branches and in lower part of lower cauline leaves; segments twice pinnately cut, each lobe with 2–5(7) lobules or teeth, 0.1–0.2 mm wide and 0.5–1(1.5) mm long, setose, linear, linear-lanceolate or less often lanceolate, terminating into more or less cartilaginous cusp. Capitula in dense, convex, compound, sometimes unequal corymbs, often subglobose in beginning of flowering. Receptacle convex to conical. Involucre oblong-cylindrical, less often oblong or ovoid-oblong, often weakly angular, 3–4(5) mm long and 1.5–2.5(3) mm in dia; involucre bracts pale, greenish-yellowish, more or less pubescent, weakly carinate, with prominent midrib; outermost involucre bracts deltoid or oblong-ovate, others oblong, with light brownish, less often brown or white, narrow, membranous border; bracts oblong-lanceolate or lanceolate, shorter than tubular florets, whitish, membranous, transparent along margin, glabrous or with appressed white hairs in upper part on outside. Ligules of outer florets yellowish-white above, whitish below, 0.9–1.5 mm long, and 1–2 mm wide, subelliptical, less often almost rotund or elliptical, apically truncate and more or less distinctly obtusely-3-toothed. Achenes oblong-cuneate, about 2 mm long, truncate at apex. Flowering June to July (August); fruiting July to August.

In steppes, less often in meadows, among shrubs, along forest edges, open glades, on grazing grounds, old fields, by roadsides, and as a weed in crops, from forest-steppe to semidesert zone, and in the Caucasus up to subalpine zone.—*European part*: Upper Volga (south), Volga-Kama (south), Upper Dnieper (south), Middle Dnieper, Volga-Don, Trans-Volga Region, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus*: Ciscaucasia, Dagestan, Eastern, Western, and southern Transcaucasia, Talysh; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Dzhungaria-Tarbagatai, Syrdarya, Tien Shan. *General Distribution*: Central and Atlantic Europe, Mediterranean Region, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from Hungary. Type in Vienna.

Note 1. It hybridizes with *A. leptophylla* MB., *A. coarctata* Poir., *A. nobilis* L. and some other *Achillea* species, as well as with *Chrysanthemum millefoliatum* L. (*Chrysanthemoachillea borzae* Prodan). In the northern part of its range and even in more southern places, where in contact with *A. millefolium* L. s. l., it is connected through intermediate forms, and in northern Kazakhstan, where in contact with *A. asiatica* Serg., intermediate forms between *A. setacea* Waldst. and Kit and the latter species, apparently also partly of hybrid origin, are observed.

Note 2. A.A. Grossheim (*Opred. Rast. Kavk.* 456) and I.P. Mandenova (in *Fl. Georgii*, VIII, 330) reported from the Caucasus *A. nabelekii* Heim. [*Publ. Fac. Univ. Masaryk*, 52 (1925) 12], described from Kurdistan. *A. nabelekii* Heim., from the *A. setacea* Waldst. and Kit. group, differs from the latter mainly by larger plant size, less densely appressed segments of the cauline leaves with the segments up
85 to 0.5 mm wide, a larger, broadly ovoid involucre (5.5 mm long and almost 4 mm in dia) and white ligules 1.75–2.0 mm long and 2.5–3.0 mm wide. *A. nabelekii* Heim. is not preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, and it is not clear whether it was really found in the Caucasus. It is possible that the most robust specimens of *A. setacea* Waldst. and Kit. were described under this name.

8. *S. asiatica* Serg. in *Sistemat. Zam. Gerb. Tomsk. Univ.* 1 (1946) 6; *Kryl. Fl. Zap. Sib.* XI, 2723.—*A. setacea* auct. fl. Sib., non Waldst. and Kit.—**Exs.:** *Gerb. Fl. SSSR*, No. 3984.

Perennial. Rhizome slender, creeping, branched; stems less numerous, less often solitary, grayish from long, fine, intertwined white hairs, (8)25–50(90) cm high, erect or ascending from base, straight or flexuous, cylindrical, finely sulcate, simple or branched above, often with short leafy branches in axils of middle and upper cauline leaves. Leaves twice pinnately cut, oblong, less often oblong-linear, oblong- or linear-lanceolate, green or grayish-green, more or less densely hairy, especially along narrow (0.5–0.75 mm wide); midrib with long, fine, white hairs, leaves of nonflowering branches long-petiolate, to 25 cm long and 0.5–1.5(5) cm wide; lower cauline leaves petiolate or subsessile, 7–20 cm long, 0.5–1.0(2.0–3.0) cm wide; middle and upper leaves sessile, 1–2 to 6(15) cm long and 0.4–1.2 cm wide; leaf segments numerous, approximate, usually 1.0–1.5 mm apart, less often to 3 mm; segments of middle cauline leaves 2–6(9) mm long and 2.5–5.0 mm wide, usually slightly longer, semiamplexicaul (auricles), gradually reduced and more distant in leaves of nonflowering branches and lower part of lower cauline leaves; segments divided in 2–4 toothed lobes, teeth, or lobules 0.5–1.0(2.0) mm long, and 0.1–0.3 (0.5) mm wide, linear, lanceolate-linear, less often almost lanceolate, terminating in cartilaginous cusp. Capitula in lax, convex, usually unequal, compound corymbs. Receptacle convex to conical. Involucre poculiform, 3–4 mm long, 2.5–3 mm in dia; involucre bracts pale, yellowish to pale green, ovate, outer involucre bracts oblong or lanceolate-oblong, with prominent midrib, weakly carinate, with brown, dark brown, less often pale brownish membranous border; bracts oblong-lanceolate, slightly shorter or almost as long as tubular florets, whitish, membranous,

transparent along margin, sparsely hairy in upper part on outside. Ligules of outer florets pink, less often purple, very rarely white, 1.0–3.0(3.5) mm long, 1.5–2.5(3.0) mm wide, subelliptical or almost rotund, truncate at apex, somewhat distinctly obtusely 3-toothed. Achenes cuneately oblong, 2 mm long, apically truncate. Flowering July to August; fruiting August to September.

- 86 In flooded and dry bottom meadows, shrub thickets, forests, forest edges and glades, open mountain slopes, and less often in steppes, in old fields and pastures, by roadsides and in fields, rarely in crops, from forest to northern part of the steppe zone.—*Western Siberia*: Upper Tobol, Irtysh, Ob River Area, Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria, Lena-Kolyma; *Far East*: Zeya-Bureya, Ussuri, Uda River Area, Okhotsk; *Soviet Central Asia*: Lake Balkhash Region (north and east), Dzhungaria-Tarbagatai. *General distribution*: Mongolia. Described from the Chulym River valley. Type in Tomsk.

Note. *A. asiatica* Serg. is close to *A. setacea* Waldst. and Kit. and, like the latter, is related to *A. millefolium* L. through transitional forms (var. *intermedia* Serg. l. c. etc.).

9. ***A. bucharica*** Winkl. in Tr. Peterb. Bot. Sada. XI (1890) 163; O. and B. Fedtsch. Perech. Rast. Turk. IV, 182; B. Fedtsch. Rast. Turk., 736.—*A. schugnanica* Winkl. op. cit. 164; O. and B. Fedtsch. op. cit. 183; B. Fedtsch. op. cit. 736.

Perennial. Rhizome thick, many-headed, branched, woody; plants densely villous-lanate with white, divergent hairs; stems few, erect or ascending from base, (5)10–25(40) cm high, simple, erect or weakly curved, cylindrical, finely sulcate. Leaves usually grayish-green from more or less dense pubescence, with distinct midrib, 0.6–1 mm wide; middle and upper cauline leaves sessile, upward directed, linear-lanceolate or lanceolate, (1)2–4(6) cm long, 3.0–0.6 cm wide, twice pinnately cut, with slightly distant segments, lower larger semiamplexicaul, divided in almost equal, entire, linear-lanceolate or lanceolate lobes, 0.3–0.5(0.7) mm wide, terminating into rather long and thin cartilaginous cusp; lower cauline leaves and those of nonflowering branches 10–15 cm long, petiolate. Capitula on lanate peduncles in dense, unequal, strongly convex, more often hemispherical, compound corymbs, 1.5–3.0(4.0) cm in dia. Receptacle convex. Involucre ovate-campanulate or oblong, about 4 mm long and 2.5 mm in dia; involucre bracts more or less densely pubescent; outer bracts ovate-oblong, others oblong-lanceolate, with dark-brown membranous border, and with weakly developed yellowish midrib; bracts finely membranous, white or brownish at apex and along margin, glabrous, oblong-lanceolate, slightly shorter than light yellow tubular florets.

Ligules of outer florets white (yellowish-white?); rotund-reniform, (0.8)1.0–1.2(1.5–2.0) mm long, (1.5)2.0–2.5 mm wide, more or less distinctly 3-toothed at apex. Achenes cuneate-oblong, 1.8–2.0 mm long. Flowering July to October.

In meadows and on stony slopes in alpine and subalpine zones.—*Soviet Central Asia*: Pamiro-Alai. *General distribution*: Known from the Lake Shiva in Afghanistan. Described from Sagyrdasht (Darvaz Range). Type in Leningrad.

87 **Note.** It varies significantly in the degree of pubescence as well as the shape and toothing of the ligules of the outer florets.

10. **A. distans** Waldst. and Kit. ex Willd. Sp. pl. III, 3 (1804) 2207; Szafer, Kulcz. Pawl. Rosl. Polskie, ed. I, 623; Klok. in Vizn. Rosl. URSR, 541.—*A. dentifera* DC. Fl. Fr. V (1815) 485 and Prodr. VI, 25.—*A. dentifera* β . *distans* (Waldst. and Kit.) Heuff. Enum. pl. Banat. (1858) 98.—*A. tanacetifolia* var. α . *dentifera* (DC.) Koch. Syn. Fl. Germ. I (1837) 374.—*A. tanacetifolia* var. β . *distans* (Waldst. and Kit.) Rochel, Pl. Banat. rar. XXIII (1828) 74, fig. 71; Hayek in Hegi, Ill. Fl. VI, 2, 575; Szafer, Kulcz. Pawl. op. cit. ed. II, 683 (sybsp.).—*A. tanacetifolia* auct. mult. Fl. Ross. non All.— **Ic.**: Rchb. Ic. Fl. Germ. XVI, f. 1025; Javorka and Csapody, Iconogr. Fl. Hung. f. 3735 f.— **Exs.**: Fl. exs. Austro-Hung. No. 995; Schulz Herb. norm. Nos. 1388, 2000.

Perennial. Rhizome slender, branched; plants more or less pubescent, with fine white hairs; stems solitary or few, erect, 30–60(90) cm high, simple, erect or weakly flexuous, cylindrical, finely sulcate. Leaves green; middle and upper cauline leaves sessile, upward directed, oblong-lanceolate, 10–12 cm long and 3–4 cm wide, twice pinnately cut, segments linear- or oblong-lanceolate, divided in lanceolate or broadly lanceolate acute lobes, usually with cartilaginous cusp, lower segments semi-amplexicaul; lower cauline leaves and leaves of nonflowering branches petiolate, twice or thrice pinnately cut, with longer segments, lanceolate; leaves on nonflowering branches 25(45) cm long and 5–6(13) cm wide; midrib 1.0–2.5(4.0) mm wide, usually toothed throughout with intermediate (between main segments), crenate-toothed lobes or teeth; young leaves sericeous, others weakly pubescent with scattered hairs. Capitula on hairy, slender peduncles in many-flowered, unequal, dense, convex, compound corymbs; inflorescence up to 12 cm in dia. Receptacle conical. Involucre oblong, (4)5–6 mm long (2)2.5–3 mm in dia; involucre bracts more or less pubescent, greenish, with narrow, membranous, dark-brown border, weakly carinate; outer bracts ovate or deltoid-ovate, others oblong-lanceolate, with prominent yellowish midrib on outside; bracts lanceolate,

membranous, white, transparent, slightly shorter than tubular florets, with long white hairs on outside. Ligules of outer florets white, less often pink, (1.8)2.5–3.0(3.5) mm long, subelliptical, apically truncate, indistinctly obtusely 3-toothed. Flowering July to August.

On open herb and stony mountain slopes, in subalpine meadows, 88 on polonines*, in forest glades, less often in beech forests.—*European part*: Upper Dniester. *General distribution*: Central Europe, Balkans. Described from Western Europe. Type in Vienna.

Note 1. Highly variable in the shape, size, and division of leaves, width and degree of toothing of the leaf midrib, color intensity of the margin of the involucre bracts, and other characters. It hybridizes with *A. millefolium* L. and some other species of the genus *Achillea*.

Note 2. M.V. Klovov (op. cit.) reported *A. tanacetifolia* All. from Western Ukraine (Carpathians), which differs from *A. distans* Waldst. and Kit. mainly in the width of the leaf midrib, broadly ovate lobes of the leaf segments and red (very rarely white) outer florets. There are no specimens of *A. tanacetifolia* All. s. s. from this region in the herbarium of the Botanical Institute, Academy of Sciences of the USSR.

Long ago C. Koch (l. c.) reported that the species of the *A. tanacetifolia* s. l. group differ from each other only in the width and toothing of the leaf midrib, as well as in the form of toothing of the leaf segments and their lobes. These characters are highly variable in *A. tanacetifolia* All. s. s., *A. distans* Waldst. and Kit., and *A. stricta* Schleich., and in many cases their identification is very tentative. Perhaps, it is more appropriate to consider them subspecies of *A. tanacetifolia* All. s. l., as was recently done by different authors, for example, Hayek (op. cit.) and others. In the absence of sufficient herbarium material, including authentic specimens, and given the lack of information on the ecology and ranges, and also not having the opportunity to observe them in nature, we cannot resolve this complex problem and describe them here as species.

11. *A. stricta* Schleich. Cat. omn. pl. in Helv. nasc. (1821) 5, nom. nud.; Heimerl in Kern. Schedae ad Fl. exs. Austro-Hung. III (1884) 118; Szafer, Kulcz. Pawl. Rosl. Polskie, ed. I, 623; Popov, Ocherk Rast. i Fl. Karpat. 247; Klok. in vizn. Rosl. URSR, 523.—*A. tanacetifolia* var. *angustifolia* Weihe in Flora, VI (1823) 749.—*A. millefolium* δ . *lanuginosa* Gaud. Fl. Helv. V. (1829) 374.—*A. tanacetifolia* var. γ . *stricta* Koch, Syn. ed. I (1837) 374; Hayek in Hegi, Ill. Fl. VI. 2, 575; Dostal, Kvetena, 1596 (subsp.); Szafer, Kulcz.

*High-mountain pastures in East Carpathian Mountains—General Editor.

Pawl. op. cit. ed. II, 683 (subsp.).—*A. distans* subsp. *stricta* (Schleich.) Janchen sec. Soo-Javorka, A. Magyar növ. kez. II (1951) 680.—*A. distans* var. *lanuginosa* (Gaud.) Mausf. Verz. (1940) 249.—**lc.**: Javorka and Csapody, Iconogr. Fl. Hung. f. 3734 p.—**Exs.**: Fl. exs. Austro-Hung. No. 994; Schultz, Herb. norm. No. 1999; Fl. Rom. exs. No. 1381.

Perennial. Rhizome slender, branched; plants more or less pubescent from fine white hairs; stem solitary, ascending or erect, 30–60(100) cm high simple, erect or flexuous, cylindrical, finely sulcate. Leaves bright green, upward directed, twice pinnately cut; segments distant, oblong, decurrent, pinnatifid in small cuspidate, narrow-lanceolate or lanceolate lobes and teeth, 0.3–0.5 to 1.0 mm wide, terminating into short cartilaginous cusp; middle and upper cauline leaves sessile, oblong
89 or oblong-lanceolate, up to 12 cm long and 2–3 cm wide, with lower segments semiamplexicaul; lower cauline leaves and leaves on nonflowering branches petiolate, lanceolate, larger, latter up to 40 cm long and 10 cm wide; midrib 1.0–1.5(2.0) mm wide, with intermediate (between main, distant segments) cuspidate, lanceolate, entire or less often pinnatifid lobes in middle and upper cauline leaves; young leaves densely sericeous with white hairs, others weakly pubescent with split hairs. Capitula on more slender, long peduncles, in dense, convex, unequal, compound corymbs. Receptacle conical. Involucre oblong, (4)5–6 mm long, (2.5)3.0–3.5(4.5) mm in dia; involucre bracts weakly pubescent, pale, slightly carinate, with light or dark brown membranous border; outer bracts ovate or ovate-oblong, others lanceolate-oblong, light green, with prominent yellowish midrib; bracts lanceolate, slightly shorter than tubular florets, white-membranous, usually with occasional hairs outside. Ligules of outer florets white or pink, (1.8)2–2.4 mm long, subelliptical or almost rotund, apically truncate, obtusely 3-toothed. Achenes 2 mm long, oblong, roundish at apex. Flowering July to September.

On open, clayey, herb and rocky mountain slopes, on polonines*, in forest glades and among shrubs.—*European part*: Upper Dniester. *General distribution*: Central Europe, Balkans. Described from Switzerland. Type in Vienna.

Note. It is extremely variable in the shape, size and division of the leaves, density of the pubescence, intensity of the color of the membranous border of the involucre bracts and other characters; it comprises a series of forms (cf. Hegi l. c.). Hybridizes with *A. millefolium* L. and some other species.

*See footnote on p. 82—General Editor.

12. **A. latiloba** Ldb. ex Nordm. in Bull. Acad. Sc. St. Pétersb. II (1837) 312 and Fl. Ross. II, 2, 534; Boiss. Fl. or. III, 259; Grossh. Fl. Kavk. IV, 123.—*A. szowitzii* Fisch. and Mey. in DC. Prodr. VI (1837) 26.—*A. dschmilensis* C. Koch in Linnaea, XXIV (1851) 324.

Perennial. Rhizome slender, creeping; plants more or less densely covered with appressed, long, soft hairs; stems solitary or few (?) 30–50 cm high, erect or weakly ascending, simple, less often sparingly branched above, straight or somewhat flexuous, sulcate, cylindrical. Leaves pinnately cut; middle leaves 4–10 cm long, upper cauline leaves lanceolate, sessile, with wide, ovate, cuspidate-incised, decurrent, up to 1 cm-long segments; upper cauline leaves smaller, pectinate-pinnately parted or pinnatifid, with narrower, entire or cuspidate segments; leaves on nonflowering branches 22–30 cm long; lower cauline leaves petiolate, narrow-lanceolate, with numerous segments, up to 1.5 cm long, lower segments smaller, remote, cuneate or lanceolate, toothed or entire; middle segments somewhat distant, ovate, decurrent on wide midrib, pinnatifid into entire or usually 2–4-toothed incised lobes with acute teeth, upper segments slightly smaller, connate. Capitula aggregated in dense, convex, compound, many-flowered corymbs. Receptacle convex. Involucre oblong, 4.5–5.5 mm long, about 3.5 mm in dia; involucre bracts reddish-brown on margin; outer bracts deltoid-ovate, others ovate-oblong, obtuse, weakly carinate, with prominent midrib; bracts oblong-lanceolate, acute, membranous, transparent on margin, slightly shorter than tubular florets, with scattered hairs outside. Ligules of outer florets white, rotund or rotund-reniform, obtusely 3-toothed at apex, 3.0(3.5) mm wide, 2.5–3.0 mm long. Achenes cuneate-oblong, about 2 mm long. Flowering July to August.

In subalpine meadows, along forest edges.—*Caucasus*: Western Transcaucasia. *General distribution*: Asia Minor, Armenia. Described from Georgia. Type in Leningrad.

Note. The prior name is *A. latiloba* Ldb. ex Nordm., which was published on July 31, 1837. The sixth volume of De Candolle's *Prodromus*, where *A. szowitzii* Fisch. and Mey. was published, was finished with printing in December of the same year.

Section 2. Filipendulinae DC. Prodr. VI (1837) 37; Ldb. Fl. Ross. II, 2, 535; Boiss. Fl. or. III, 254.—Ligules yellow or golden; leaves pinnately parted or pinnately cut, leaf segments not membranous.

13. **A. filipendulina** Lam. Encycl. meth. I (1783) 27; DC. Prodr. VI, 28; Ldb. Fl. Ross. II, 2, 535; Boiss. Fl. or. III, 259; O. and B. Fedtsch. Perech. Rast. Turk. IV, 181; Grossh. Fl. Kavk. IV, 124.—*A. eupatorium* MB. Tabl. prov. Casp. (1798) 119 excl. synonym. Tourn.; Fl.

taur.-cauc. II, 337; III, 585; Willd. Sp. pl. III, 3, 2205.—*A. filicifolia* MB. Fl. taur.-cauc. II (1808) 338 and III, 585.—*Tanacetum angulatum* Willd. Tract. de Achilleis (1789) 52, 2, f. 3.—**lc.**: Gartenflora, XXVIII, tab. 264.—**Exs.**: GRF Nos. 1874, 3985.

Perennial. Rhizome woody; whole plant more or less densely pubescent from slightly appressed hairs; stems less numerous, less often solitary, (25)40–70(120) cm high, erect, ribbed-sulcate, straight or weakly flexuous, simple, less often sparingly branched, densely leafy, very rarely with short branches in axils of cauline leaves. Leaves pubescent, with frequent punctate-alveolate glandular hairs on both sides, wide, oblong-lanceolate, pinnately parted, with decurrent oblong-lanceolate, or oblong, crenulate and obtusely toothed large segments; midrib of leaves serrate-dentate; leaves on nonflowering branches long-petiolate, up to 40 cm long; lower cauline leaves petiolate, middle 8–18 cm long, with (0.5)1.5–2.0(3.0) cm-long middle segments, lower
91 segments smaller, more remote; upper leaves sessile, smaller, uppermost about 1 cm long, filiform-linear, serrate-dentate or entire. Capitula with few or many flowers, in dense, large (to 10 cm in dia), compound, convex, unequal corymbs. Receptacle convex to oblong-cylindrical. Involucre oblong-obconical, often with elongate base, or oblong-cylindrical, 3–4 to 9–10 mm long and about 2 mm in dia; involucre bracts deltoid-oblong, pubescent, pale; bracts oblong-lanceolate, much shorter than florets. All flowers tubular, or outer flowers short-ligulate, often irregular, with small (up to 1 mm long) three-lobed reniform-rotund, bright yellow ligules. Achenes oblong, 1.5–1.75 mm long. Flowering June to July (September).

On gravel beds in river valleys, on stony, clayey, clayey-sandy soils along irrigation channels, springs and streams, as well as in old fields and open dry mountain slopes, in glades and along edges of mountain forests and shrub thickets. From foothill plains to upper part of the tree belts (Caucasus) and tree-shrub (Soviet Central Asia) vegetation.—*European part*: Crimea (?); *Caucasus*: Ciscaucasia, Eastern and Southern Transcaucasia; *Soviet Central Asia*: Tien Shan, Syr-Darya, Pamiro-Alai. *General distribution*: Armenia-Kurdistan, Iran. Described from collections of Tournefort from "Levant." Type in Paris.

Note. It hybridizes with *A. millefolium* L. It varies greatly in the shape of the receptacle, involucre, number of florets in the capitula, density of pubescence, shape of the leaf segments and some other characters. It forms several varieties. These varieties are found sporadically in different parts of the general range of *A. filipendulina* Lam., do not have separate ranges, and are connected by transitional forms.

Var. *leptoclina* DC. l. c.—Receptacle elongated, oblong-cylindrical; capitulum many-flowered (30–40 flowers); involucre oblong-cylindrical, up to 9–10 mm long; all flowers tubular, outer sometimes slightly deformed.

Var. *eupatoria* (MB.) DC. l. c. [*A. eupatoria* MB (l. c.)].—Receptacle not elongated; capitula few-flowered (8–10 flowers); all flowers tubular.

Var. *filicifolia* (MB.) DC. l. c. [*A. filicifolia* M.B. (l. c.)].—Receptacle not elongated; capitula few-flowered (8–10 flowers); outer flowers with short, almost trilobate ligule.

Var. *szowitziana* DC. l. c.—Receptacle not elongated; capitula few-flowered (8–10 flowers); outer flowers short-ligulate; leaves sericeous, with linear-lanceolate acute segments.

14. **A. coarctata** Poir. in Lam. Encycl. meth. Suppl. (1810) 94; Prodan. Fl. Rom. 1003.—*A. compacta* Willd. Sp. pl. III, 3 (1804) 2206, non Lam. Encycl. meth. I (1783) 27; DC. Prodr. VI, 28; Ldb. Fl. Ross. II, 2, 536; Boiss. Fl. or. IV, 261; Schmalh. Fl. II, 65; Grossh. Fl. Kavk. IV, 125; Klok. in Vizn. Rosl. URSR, 544.—*A. glomerata* 92 MB. Fl. taur.-cauc. III (1819) 585.—*A. sericea* Janka in Linnaea, XXX (1859) 579.—*A. tomentosa* Stankov, Opređ. Rast. (1949) 626, non L.—**lc.**: Rchb. Sc. Fl. Germ. XVI, f. 1024; Javorka and Csapody, Iconogr. Fl. Hung. f. 3730s.—**Exs.**: Rchb. Fl. Germ. exs. No. 2343; Fl. Graeca, exs. No. 751; Balansa, Pl. D'orient. No. 244; Dörfler, Herb. norm. No. 3043; Fl. exs. Austro-Hung. No. 1825; Fl. Hung. exs. No. 80.

Perennial. Rhizome vertical, long, thickened in upper part, many-headed; plants densely sericeous (ferruginous-sericeous on long storage); stems few, less often solitary, (12)25–40(75) cm high, cylindrical, finely sulcate, slightly ascending from base or erect, straight or slightly flexuous, simple, sometimes weakly branched, often with undeveloped, short, leafy branches in axils of middle cauline leaves. Leaves linear-lanceolate; middle cauline leaves (2)4–6(9) cm long, upward directed, usually slightly sinuate or arcuate, sessile, pinnately cut, with numerous, approximate, oblong segments, 4–6 mm long, larger at leaf base, semiamplexicaul; segments pinnately parted, with linear, entire, less often 2–3-toothed lobes, obtuse or sometimes short-cuspidate; segments of upper-most leaves usually entire, usually only near leaf base; midrib narrow, usually with teeth between main segments in upper part; leaves on nonflowering branches petiolate, (6)15–20 cm long, with distant, unequal segments, 2–5 to 10–35 mm long. Capitula on short peduncles, thickened from dense pubescence, aggregated in many-flowered, very dense, strongly convex, often almost semiglobose corymbs. Receptacle at beginning of anthesis almost flat or weakly

convex, at fruiting usually oblong-conical. Involucre turbinate, 3–4 mm long, 2.5–3.5 mm in dia; involucre bracts membranous, outermost oblong-narrow deltoid, others oblong, obtuse, convex dorsally, with narrow membranous border in upper part, sometimes brownish at apex; bracts slightly shorter than tubular flowers, finely membranous below, white-membranous in upper half, oblong, obtuse, sinuate-toothed at apex, glabrous or with occasional hairs on outside. Ligules of outer florets small, a fifth to a third as long as involucre, reniform, obtusely 3-toothed, often undeveloped or absent. Achenes cuneate-oblong, about 1 mm long. Flowering May to July (August).

In dry stony places.—*European part*: Bessarabia. According to Klokoy (op. cit.), distributed in the Black Sea Region, which has not been confirmed. *General distribution*: Balkans-Asia Minor, Armenia-Kurdistan (north), Central Europe (Romania, Bulgaria). Type in Paris.

Note. *A. coarctata* Poir. hybridizes with *A. setacea* Waldst. and Kit. (*A. romanica* Prod. op. cit. 1003), *A. neilreichii* Kern. (*A. dobrogensis* Prod. op. cit. 1004), *A. leptophylla* MB. (*A. nyaradyana* Prod. op. cit. 1003), as well as with several other species of the genus.

15. ***A. ochroleuca*** Ehrh. in Beitr. z. Naturk. VII (1792) 166, non Willd. Sp. pl. III, 3 (1804) 2210; Waldst. and Kit. Pl. rar. Hung. 1, 33; Afanasiev in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX, 365.—*A. pectinata* Willd. op. cit. 2197, non Lam. Encycl. meth. I (1783) 28; DC. Prodr. VI, 28; Ldb. Fl. Ross. II, 2, 535; Boiss. Fl. or. III, 262; Schmalh. Fl. II, 65; Prodan, Fl. Rom. I, 2, 1001; Dostal, Kvetena, CSR, 1592; Klok. in Vozn. Rosl. URSR, 544.—**lc.**: Waldst. and Kit. op. cit. tab. 34; Rchb. Ic. Fl. Germ. XVI, f. 1041; Javorka and Csapody, Iconogr. Fl. Hung. f. 3729f.—**Exs.**: Fl. exs. Austro-Hung. No. 999; Fl. Hung. exs. No. 579.

Perennial. Rhizome woody, many-headed; stems grayish from appressed tomentose pubescence, few, ascending from base, less often straight, (10)25–35(60) cm high, finely sulcate, cylindrical below, weakly angular above, simple, sometimes sparingly branched above, often with short leafy branches in axils of middle cauline leaves. Leaves with appressed pubescence or sub-glabrous, usually punctate-alveolate on both sides, upward directed, linear, pinnately parted, 2–3(4) cm long, with broad (up to 1.5–2.0 mm wide) midrib, segments pectinate, arranged somewhat distant, antrorse, decurrent, 1–3(5) mm long, linear or subulate-linear, acute, with very short white-cartilaginous cusp, entire or some 1–3-toothed; middle cauline leaves sessile, basally with longer, often linear-filiform segments, slightly amplexicaul; lower cauline leaves as well as leaves on nonflowering branches and that on short branches, and often also uppermost cauline leaves long-petiolate, with segments

usually only in upper half and near base (auricles). Capitula on densely tomentose peduncles, in compound, convex, usually dense and unequal corymbs. Receptacle flat at flowering, convex at fruiting. Involucre ovate or oblong-ovate, 2.5–3.0(3.5) mm long, 2.0–2.5(3.0) mm in dia; involucre bracts membranous, weakly carinate, with thick midrib; outermost bracts deltoid-ovate, other oblong, obtuse, white-membranous on margin, sometimes light brown at apex; bracts oblong-lanceolate, much shorter than tubular florets, almost membranous, with wide white border, glabrous or with occasional hairs outside. Ligules pale yellow (sometimes white?), almost a half as long as involucre, oblong-rotund, with 3 indistinct obtuse apical teeth. Achenes cuneately oblong, about 1.25 mm long. Flowering June to August.

On sands, less often on sandy loam soils and stony outcrops.—*European Part*: Black Sea Region, Bessarabia. *General distribution*: Balkans; Central Europe, Romania, Hungary, Czechoslovakia. Described from Hungary. Type in Vienna?

- 94 **Note.** It varies considerably in the pubescence and dissection of the leaves.

The Caucasian botanists A.A. Grossheim, D.I. Sosnowsky, I.P. Mandenova and others, following E. Boissier, mistakenly accepted as *A. ochroleuca* Ehrh. the yellow-flowered race of yarrow close to *A. nobilis* L., the correct name of which is *A. neilreichii* Kern. (cf. Afanasiev, l.c.).

1. ***A. leptophylla*** MB. Fl. taur.-cauc. II (1808) 335; DC. Prodr. VI, 29; Ldb. Fl. Ross. II, 2, 536; Boiss. Fl. or. III, 262; Grossh. Fl. Kavk. IV, 125; Klok. in Vozn. Rosl. URSR, 544; Majevsk. Fl., Ed. 8, 579.—*A. leptophylla* f. *granilica* and f. *desertorum* Paczoski in Vestn. Russk. Fl. III, 4. (1917) 155.—*A. gerberi* β. *leptophylla* (MB.) Schmalh. Fl. II (1897) 66.—*A. taurica* MB. Fl. taur.-cauc. II (1808) 336 and III (1819) 584; DC. op. cit., 29.—*A. taurica* f. *villosior* Boiss. op. cit. 262.—? *A. leptophylloides* Prod. in Contrib. bot. Cluj, I, fasc. 17 (1928) 8.—**lc.**: Vozn. Rosl. URSR, Fig. 292; Stankov and Taliev, Opred. Fig. 333.—**Exs.**: GRF No. 820; Herb. Fl. Ucr. No. 98.

Perennial. Rhizome slender, short, vertical, strongly branched, grayish-green, tomentose-villous, very rarely plants subglabrous; stems numerous, less often solitary, (6)12–25(35) cm high, cylindrical, usually divaricately branched from base, less often simple, sometimes with short leafy branches in axils of cauline leaves. Leaves linear-lanceolate; lower leaves oblong-linear, (1.5)2.0–4.0(7.0) cm long, pinnately cut, usually with thin, narrow, toothless midrib; segments antrorse, in upper leaves usually entire, toothlike or short-linear, in other cauline leaves 3–4(5) mm long, incised or less often divided in 3–5 oblong, oblong-

spatulate or short-linear lobes, (0.5)1.0–2.0 mm long, obtuse or subacute; lower leaves petiolate, with somewhat distant segments and with 3–4 pairs of larger segments near base, more or less amplexicaul. Capitula on longer, slender peduncles, in somewhat lax, convex, few-flowered (usually about 10 capitula) compound corymbs. Receptacle flat or slightly convex. Involucre short-ovate or almost semiglobose, densely appressed-hairy, 3–4 mm long, (2.0)2.5–3.5 mm in dia; involucre bracts greenish, with prominent midrib; outer bracts acute-ovate, others oblong, white-membranous along margin; bracts slightly shorter than tubular florets, oblong or almost ovate, membranous with wide white border, more or less glandular on outside, glabrous or sparsely appressed hairy in upper part. Ligules of outer florets bright yellow (at beginning of flowering, according to published reports, almost orange), 1.5–2.0 mm long, rotund-reniform or subelliptical, apically truncate, more or less distinctly obtusely 3-toothed, a third to half as long as involucre. Achenes cuneate-oblong, slightly roundish at apex, 1.0–1.25(1.5) mm long. Flowering May to July; fruiting June to August.

Usually grows as isolated individuals on clay and clayey loam, less often on stony-rubbly soils and stony outcrops in semideserts and steppe zones.—*European part*: Black Sea Region, Crimea, Lower Don, Lower Volga, Trans-Volga Region; *Caucasus*: Ciscaucasia. Reported from Balkans (Romania, Bulgaria). Described from the south of the European Part of the USSR. Type in Leningrad.

Note. The plants on stony outcrops (granite, slate, limestone) often differ significantly in the dissection of the leaves with more extensive, lax and weak pubescence. Paczosky (op. cit.) separated such specimens on granite as f. *granitica* Pacz.

Forms transitional to *A. micrantha* Willd., partly of hybrid origin, are found in the western part of the range of *A. leptophylla* in Ciscaucasia.

It forms hybrids with *A. setacea* Waldst. and Kit., *A. nobilis* L., *A. glaberrima* Klok., *A. coarctata* Poir. and *A. millefolium* L.

Apparently, *A. leptophylla* MB. s. str. is distributed in the northern and western parts of Crimea, and a closely related race grows on the Kerch Peninsula and the southern coast.

17. ***A. glaberrima*** Klok. in Ind. sem. Hort. Bot. Charjkov. (1925) 6; in Ukr. Bot. Zhurn. 3 (1926) 20; Vizn. Rosl. URSR, 544.

Perennial. Rhizome reduced, many-headed; plants dark green, entirely glabrous; stems few, less often to 15 or solitary, 16–35(50?) cm high, cylindrical, finely sulcate, erect or ascending from base, with short leafy branches in axils of cauline leaves, branched above. Leaves

somewhat thick, punctate-alveolate on both sides, oblong-linear or linear, 2–4(7) cm long, petiolate, pinnately parted, uppermost leaves entire or with isolated segments, antrorse or erect; segments entire or 1–2-lobed, 1–2(3) mm long, entire, oblong-ovate, oblong or short-linear, subobtusate, with very short, sometimes cartilaginous cusp, segments longer at base. Capitula on slender, up to 5 mm-long peduncles, in few-flowered, lax, compound corymbs. Receptacle convex. Involucre globose-ovoid, about 4 mm long, 2.5–3.5 mm in dia; involucre bracts membranous, light green, with wide, yellowish membranous border, outer bracts ovate, others oblong; bracts oblong-lanceolate, membranous, white, transparent, much shorter than tubular florets; ligules of outer florets yellow, 1.25–1.5 mm long, almost rotund, truncate at apex, with 3 unequal obtuse teeth. Achenes oblong-cuneate, about 1.25 mm long. Flowering June to July.

96 On granite outcrops.—*European part*: Black Sea Region. Endemic. Described from southern Ukraine. Type in Kiev.

Note. Found only in the Stalino (Donetsk) Region in the village of “Kamenny mogily” (Bestash-Gora) over an area of about 4 km². According to M.V. Klovov, it hybridizes with *A. leptophylla* MB.

18. *A. micrantha* Willd. Tract. de Achilleis (1789) 33, non *A. micrantha* Willd. Sp. pl. III, 3 (1804) 2209; Afan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX, 361.—*A. gerberi* Willd. Sp. pl. III, 3, (1804) 2196; MB. Fl. taur.-cauc. II, 334; DC. Prodr. VI, 29; Ldb. Fl. Ross. II, 2, 536; Boiss. Fl. or. III, 263; Schmalh. Fl. II, 65; Grossh. Fl. Kavk. IV, 125; O. and B. Fedtsch. Perech. Rast. Turk. IV, 182; Szafer, Kulcz. Pawl. Rosl. Polskie, ed. II, 684; Majevsk. Fl. Ed. 8, 579; Kryl. Fl. Zap. Sib. XI, 2727.—*A. gerberi* β . *subcristata* DC. l. c.—*A. gerberi* α . *major* and β . *minor* C. Koch, in Linnaea, XXIV (1851) 326.—*A. gerberi genuina* Schmalh. l. c.—*A. gerberi genuina* δ . *tenuifolia* Schmalh.—*A. gerberi* var. *leptophylla* Serg. in Kryl. Fl. Zap. Sib. XI (1949) 2727, non Schmalh.—*A. aegyptiac* S. Gmelin, Reise, II (1774) 198, non L.—*A. cancrini* Grun. in Bull. Soc. Nat. Mosc. XVI, 4 (1869) 417; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2, 450.—*A. santolina* Falk, Beitr. II (1786) 243, non L. sec. Ldb. l. c.—? *A. birjuczensis* Klok. in Vizn. Rosl. URSR (1950) 541.— **Ic.**: S. Gmelin op. cit. tab. 8, f. 2.— **Exs.**: GRF No. 673.

Perennial. Rhizome slender, with short underground branches; plants grayish, more or less tomentose; stems 2–3, less often solitary, 20–40(50) cm high, indistinctly angular, usually weakly flexuous, simple, less often weakly branched above, usually with short, densely leafy branches in axils of cauline leaves. Cauline leaves petiolate, linear or oblong, 3–5(10) cm long, often more or less falcate, with

wide midrib, pinnately cut; segments usually complicate, often slightly distant in lower and middle cauline leaves, punctate-alveolate on both sides, ovate or oblong, somewhat decurrent, incised or divided in 3–5 ovate, obovate, oblong, rarely lanceolate lobes, entire or sometimes incised toothed, terminating in cartilaginous cusp, less often segments entire. Capitula in compound, dense, somewhat convex, corymbs. Receptacle conical, less often weakly convex. Involucre oblong or oblong-ovoid, 3–4(5) mm long, 2–3 mm in dia; usually appressed-hairy; involucre bracts yellowish-green; outer bracts ovate, others oblong, carinate, with narrow white membranous border; bracts lanceolate, much shorter than tubular florets, membranous, with narrow white margin, glabrous or glandular outside and with few appressed hairs in upper part. Ligules of outer florets yellow, small, 0.8–1.25 mm long, a fourth to a third as long as involucre, rotund-reniform, with 3 obtuse teeth. Achenes cuneate-oblong, apically truncate, finely rugose, 1.25–1.5 mm long. Flowering June to August; fruiting July to September (October).

Grows in circular patches on sands, sandy soils, less often in steppe pastures and alkaline meadows, from forest-steppe to desert zones.—*European part*: Ladoga-Ilmen (introduced), Bessarabia (?), Middle Dnieper, Black Sea Region, Crimea, Volga-Don, Lower Don, Lower Volga, Trans-Volga Region; *Caucasus*: Ciscaucasia; *Soviet Central Asia*: Aralo-Caspian Region, Kyzyl-Kum (north), Syr-Darya; *Western Siberia*: Upper Tobol, Irtysh. Endemic. Reported as an introduced plant several times in Western Europe (vicinity of Berlin and other places). Described from the southeast of the European part of the USSR. Type in Berlin.

Note 1. A quite polymorphic plant. It varies significantly in the shape and dissection of the leaves, shape and size of the capitula, etc., on the basis of which different forms, having no importance as species, have been segregated (see above). Forms transitional to *A. leptophylla* MB. and *A. biebersteinii* Afan. are found, especially in the western part of its range, apparently partly of hybrid origin. It also hybridizes with *A. millefolium* L. and rarely with *A. setacea* Waldst. and Kit. The form distributed in Crimea needs further study.

Note 2. This species was first described and validly published by Willdenow in *Tract. de Achilleis* in 1789 under the name *A. micrantha* Willd. Willdenow described the same plant in 1804 in *Species Plantarum* as *A. gerberi* Willd. Therefore, according to the International Rules of Botanical Nomenclature, unfortunately the long-established and generally accepted name *A. gerberi* Willd. should be rejected as invalid and replaced by the priority name *A. micrantha* Willd. (cf. Afanasiev, op. cit.).

19. *A. biebersteinii* Afan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 361, nom. nov.—*A. micrantha* Willd. Sp. pl. III, 3 (1804) 2209; non 1789; MB. Fl. taur.-cauc. II, 336 and III, 584; DC. Prodr. VI, 29; Boiss. Fl. or. III, 264; O. and B. Fedtsch. Perech. Rast. Turk. IV, 182; Hayek, Prodr. Fl. Balcan. 644; Grossh. Fl. Kavk. IV, 125 and Opred. Rast. Kavk. 457.—?*A. abrotanifolia* Willd. op. cit. 2213, p. p.—*A. micrantha* β . *sulfurea* DC. Prodr. VI (1837) 29.—*A. millefolium* var. *micrantha* (MB.) Schmalh. Fl. II (1897) 64, p. max. p.—*A. pubescens* auct. mult. fl. Ross. non L.—*A. tomentosa* auct. fl. ross. non L.—*A. decumbens* auct. fl. Ross. non Lam.—*A. odorata* Grossh. Fl. Kavk. IV, 123, non L. nec Koch.—Ic.: Boulomoy, Fl. Liban et Syrie, tab. 219, f. 1 and 221, f. 1.—Exs.: Fl. cauc. exs. No. 298; Fl. Palestinae exs. No. 96; H.B.P. No. 49.

98 Perennial. Rhizome slender, branched, woody in upper part; plants grayish-green, more or less densely covered with long, weakly appressed, hairs; stems few, less often solitary, straight or weakly flexuous, (12)20–35(60) cm high, finely sulcate, cylindrical below, weakly angular above, often with short leafy branches in axils of cauline leaves, simple, sometimes branched above. Cauline leaves pinnatisect, sessile, linear-lanceolate to oblong-linear, mostly upward directed, straight or more or less falcately bent upward; segments numerous, somewhat distant, especially in lower half of leaves, leaves longer at base, semiamplexicaul (auricles), pinnately cut or parted in 3(5) narrow, somewhat obtuse, linear, oblong-linear, less often lanceolate lobes, terminating in short, usually cartilaginous cusp; midrib usually narrow, not toothed; middle cauline leaves (2)3–4(10) cm long, with segments (2)3–5(8) mm long and lobes (1)2–3(4) mm long; uppermost leaves mostly with entire, narrow segments; leaves on nonflowering branches twice pinnately cut, petiolate, (5)8–12(25) cm long, with distant smaller segments in lower part. Capitula usually on short peduncles, in more or less dense, convex, compound, usually unequal corymbs. Receptacle convex or conical, involucre oblong to ovate, 3–4 mm long, (2.0)2.5–3.0 mm in dia; involucre bracts thin-membranous, light colored, yellowish, usually glaucous, weakly carinate, with midrib prominent dorsally, white-membranous along margin, obtuse; outer bracts ovate or oblong, others oblong, bracts wide, oblong, less often broadly lanceolate, short, almost a half as long as tubular florets, thin-membranous, transparent. Ligules of outer florets golden or bright yellow, 1/2–1/3(2/7) as long as involucre, rotund-reniform or semi-circular, 1.0–1.5(1.8) mm long, 1.5–2.0(3.0) mm wide, truncate above with 3-obtuse, unequal teeth. Achenes 1.0–1.25 mm long, cuneate-oblong, roundish at apex. Flowering May to August.

On clayey, stony, sometimes sandy soils, less often on stony outcrops and gravel beds along riverbanks in foothill plains, foothills, and along mountain slopes up to 2,500(3,000) m, in desert, semidesert, steppe and less shrubby, forest and meadow vegetation. Also found in irrigated and unirrigated fields, and on old fields, wastelands, along roads, irrigation channels, etc.—*European part*: Lower Don (south); *Caucasus*: Eastern, Western and Southern Transcaucasia, Ciscaucasia, Dagestan; *Soviet Central Asia*: mountainous Turkmenia, Kara-Kum, Amu-Darya, Kyzyl-Kum (south), Pamiro-Alai Region Syr-Darya, Tien Shan, Lake Balkhash Region, Dzhungaria-Tarbagatai. *General distribution*: Eastern Mediterranean Region, Balkans-Asia Minor, Armenia-Kurdistan, Iran. Described from Asia Minor. Type in Berlin?

Note. It varies greatly in the degree of pubescence, size and division of the leaves, shape of the involucre, color of the florets and some other characters and comprises a series of more or less weakly separated forms with presently unknown ranges. Differentiation of all these forms and descriptions of some as separate geographical races is possible only after observing them in nature and monographic treatment of the section *Filipendulinae*.

Evidently, it hybridizes with *A. leptophylla* MB., *A. setacea* Waldst. and Kit., and *A. nobilis* L.

According to the International Rules of Botanical Nomenclature (Article 61), the name *A. micrantha* Willd. Sp. pl. III, 3 (1804) 2209, under which it was first described, cannot be retained for this species, as it is a latter homonym of *A. micrantha* Willd. *Tract. de Achilleis* (1789)33. Therefore, we have to reject the commonly accepted name "*micrantha*" for this species and replace it with another (cf. Afan. op. cit. and Note to the previous species).

20. ***A. cuneatiloba*** Boiss. and Buhse in Nouv. Mém. Soc. Nat. Mosc. XII (1860) 117; Boiss. Fl. or. III, 257; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2, 450; Grossh. Fl. Kavk. IV, 125 and Opred. Rast. Kavk. 456.—**lc.**: Boiss. and Buhse, l. c. tap. X, f. II.

Perennial. Rhizome slender, branched; plant light green, sparsely covered with long, weakly appressed hairs; stems few or solitary, erect, 25–50 cm high, straight or weakly flexuous, simple, finely sulcate, cylindrical in lower part, slightly angular above. Leaves oblong-linear, punctate-alveolate on both sides; lower cauline leaves and leaves on nonflowering branches petiolate, others sessile, twice pinnately cut, with somewhat distant segments, decurrent over somewhat narrow midrib and slightly amplexicaul, divided in linear-cuneate divergent lobes, 2–4 mm long, slightly broadened above, obtuse, with very short, cartilaginous cusp; uppermost leaves pinnatisect, with entire segments.

Capitula on longer peduncles in compound, lax, unequal corymbs. Receptacle short-conical. Involucre ovate, 3.5–4.0 mm long, 2.5–3.0 mm in dia, weakly pubescent; involucre bracts pale, yellowish, slightly carinate, with prominent midrib, with white membranous border; outer bracts deltoid or deltoid-ovate, others oblong, obtuse; bracts broadly lanceolate, acute, membranous, white, transparent, glabrous, much shorter than tubular florets. Ligules of outer florets light yellow, rotund-reniform, a third to a half as long as involucre, with three obtuse teeth at apex. Achenes cuneate-oblong, slightly roundish at apex, about 1 mm long. Flowering May to July.

On herb slopes, along edges of forests in middle mountain zone.—*Caucasus*: Southern Transcaucasia. *General distribution*: Armenia-Kurdistan. Described from Southern Transcaucasia. Type in Geneva.

Note. Sommier and Levier described *A. cheilanthifolia* Somm. and Lev. in *Tr. Peterb. Bot. Sada*, XVI (1900) 239 from Transcaucasia on the basis of a single specimen collected by Brotherus, "Achalczi in Cartalinia, 7 Jun. 1881 fl. fr. juv. (No. 521 Brotherus)." We have not seen the herbarium specimens of this species but, judging from the description, it differs from *A. cuneatiloba* Boiss. and Buhse by having smaller lobes of the leaf segments, 1.0–1.5 mm long and very short ligules, slightly exserted from the involucre.

21. *A. micranthoides* Klok. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 360 and in Vizn. Rosl. URSR, 544.—*A. micrantha* auct. fl. Ucr. non Willd. 1804.—*A. millefolium* var. *micrantha* (MB.) Schmalh. Fl. II (1897) 64, p. p.

Perennial. Rhizome short; plants grayish-green from sparse villous-tomentose pubescence; stems few, sometimes solitary, (12)20–30(42) cm high, erect, sulcate, very weakly flexuous or straight, simple, with short, densely leafy branches in axils of cauline leaves, rarely weakly branched above. Leaves oblong-elliptical or oblong, (1.5)3.0–5.0(9.0) cm long, usually upward directed with frequent punctate-alveolate glandular hairs on both sides, pinnately cut, with antrorse, somewhat distant, oblong, incised or lobed segments, lobes linear or oblong, acute, terminating in short cartilaginous cusp; segments of uppermost cauline leaves usually entire; middle and upper cauline leaves sessile, with oblong, slightly amplexicaul (auricles) segments; lower leaves petiolate; midrib narrow, with few toothless or incised small intermediate lobes in upper part between main segments, midrib of uppermost leaves without intermediate lobes. Capitula in lax, compound, often unequal, convex corymbs. Receptacle convex. Involucre ovate, 3–4 mm long, 2.0–2.5 mm in dia; involucre bracts membranous, weakly carinate, outer oblong-ovate, others oblong, with narrow membranous

border; bracts oblong-lanceolate, glabrous or with isolated hairs outside, along margin, especially at apex transparent. Ligules of outer florets light yellow, rotund-reniform, 0.8–0.9 mm long, with 3 obtuse teeth. Achenes oblong, apically truncate, about 1.5 mm long. Flowering June to July.

On slopes of steppe depressions—heaths.—*European part*: Black Sea Region. Endemic. Described from southern Ukraine. Type in Leningrad.

Section 3. Santolinoideae DC. Prodr. VI (1837) 30; Ldb. Fl. Ross. II, 2, 538; Boiss. Fl. or. III, 254; Hoffm. in Pflanzenfam. IV, 5, 272.—Leaves narrow, segments small, transverse, imbricate, ternate, less often entire; ligules yellow, less often white.

101 22. *A. wilhelmsii* C. Koch in Linnaea, XXIV (1851) 328; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2, 451; Afan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XV, 397.—? *A. santolina* L. Sp. pl. (1753) 896 p. p.; DC. Prodr. VI, 31 p. p.; Boiss. Fl. or. III, 266 p. p.—*A. santolina* auct. fl. Cauc. non L.—*A. eriophora* auct. fl. Ross. non DC.—*A. terctifolia* Ldb. Fl. Ross. II, 2, (1845–1846) 536, non Willd.—*Exs.*: Pl. or. exs. No. 297.

Perennial. Rhizome slender; stems numerous, somewhat woody, cylindrical, grayish from dense and appressed short-tomentum, erect or ascending, straight or weakly flexuous, (10)15–20(25) cm high, with numerous, short, densely leafy branches in axils of cauline leaves, with upward directed branches, sometimes simple. Leaves subglabrous, rarely somewhat pubescent, linear, (1.0)1.5–2.0(3.0) cm long, usually upward directed, often falcately bent, pinnately cut, with numerous, approximate, transverse, small, about 1 mm-long, ternate segments with rotund-obovate or obovate, very finely toothed lobes, imbricate, covering midrib in young leaves and leaves of short branches; segments of lower leaves more distant, narrower, often entire, cuspidate. Capitula in compound, rather dense corymbs. Receptacle, flat. Involucre obovate, pointed, 2.5–3.0(3.5) mm long, 2.5–3.0 mm in dia; involucre bracts appressed-hairy, oblong, obtuse, carinate, outer often brownish at apex, others with narrow white-membranous border; bracts lanceolate, thin, membranous, with wide white membranous border, appressed-hairy in upper half on outside. Ligules of outer florets yellow, three-lobed, small, a fourth to a third as long as involucre. Achenes oblong-carinate, about 1 mm long. Flowering May to July.

On dry stony-gravelly and clayey slopes, in screes, along irrigation channels, and as weed in crops.—*Caucasus*: Eastern and Southern Transcaucasia, Talysh. *General distribution*: Armenia-Kurdistan, Asia Minor. Described from Transcaucasia. Type in Berlin?

23. *A. kermanica* Gand. in Bull. Soc. bot. Fr. 65 (1918) 37.—*A. krascheninnikovii* Afan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XV (1953) 395.—*A. santolina* auct. non L.: Boiss. Fl. or III (1875) 266 p. p. and auct. fl. Asiae Mediae.—Exs.: GRF No. 3986.

Perennial. Rhizome slender; stems (12)15–25(32) cm high, numerous, somewhat woody, cylindrical, grayish-green from sparse, more or less dense pubescence, ascending or erect, usually distinctly flexuous, with short densely leafy branches in axils of cauline leaves and with upward directed branches, sometimes simple. Leaves grayish-green, more or less densely pubescent, linear, (1.5)2.0–3.0(5.0) cm long, usually falcately bent and often antrorse, pinnately cut, with numerous, distant, small, 1–1.5(2) mm long, ternate segments with lobate or oblong-obovate uncate lobes, often imbricate covering midrib in young leaves and leaves of short branches; segments of lower leaves more distant, sharp toothed. Capitula in compound lax corymbs. Receptacle flat. Involucre obovate, pointed, 3.0–3.5(4.5) mm long and 2.5–3.0 mm in dia; involucre bracts loosely tomentose, oblong, obtuse, carinate, outer often greenish and brown at apex, others with narrow white-membranous border; bracts lanceolate, thin-membranous, with white-membranous border, on outer side usually pubescent from base. Ligules of outer florets yellow, three-lobed, small, a fourth to a third as long as involucre. Achenes oblong-cuneate, 1.5–2.0 mm long. Flowering April to July.

In deserts and semideserts in clayey and loessial, often saline or gypseous soils, less often on takyr and stony slopes of valleys and ravines, often along irrigation channels and as weed in crops.—*Soviet Central Asia*: mountainous Turkmenia, Pamiro-Alai, Amu-Darya, Syr-Darya, Kara-Kum. *General distribution*: Iran. Described from Kerman. Isotype in Leningrad; type in Paris.

24. *A. vermicularis* Trin. in Mém. Acad. Sc. St. Pétersb. VI (1818) 494; DC. Prodr. VI (1837) 32 errore “vernuculata”; Ldb. Fl. Ross. II, 2, 539; Boiss. Fl. or. III, 266; Grossh. Fl. Kavk. IV, 123.—*A. amoena* C.A.M. Verz. (1831) 76.—*lc.*: Trin. op. cit. t. XIII.

Perennial. Rhizome thick, woody; stems numerous, hard, cylindrical, finely sulcate, grayish from dense short and appressed-tomentose pubescence, usually bent or flexuous, branched, 20–40(55) cm high, with numerous, short, leafy branches in axils of distant cauline leaves. Leaves glaucous, densely pubescent, pinnately cut, linear, 1–2 cm long, falcate or sinuate; upper and middle cauline leaves, as also leaves on short branches, cylindrical, almost cylindrical, with numerous approximate transverse, small, about 1 mm long ternate segments with sharply toothed lobes imbricately covering midrib; lower leaves with

distant, narrower and more strongly acute segments, not covering midrib continuously. Capitula in few-flowered, mostly simple corymbs or solitary at apices of branches. Receptacle convex. Involucre densely pubescent, semiglobose or almost globose, 4–5 mm long and (4)5–6 mm in dia; involucre bracts with prominent midrib, and wide, membranous, transparent, white border, sometimes brownish or brown; outer bracts ovate or oblong-ovate, others oblong, bracts almost as long as tubular florets, oblong-lanceolate, appressed-hairy on outside, with wide, transparent, white, membranous, toothed border. Ligules of outer florets light yellow, rotund-reniform, 2.2–2.5(3.0) mm wide and 1.5–2 mm long, indistinctly obtusely 3-toothed, 2/5–1/2 as long as involucre. Achenes cuneately oblong, 1.5–2.0 mm long. Flowering June to August.

On dry gravelly and stony mountain slopes from 1,500 m to the 103 alpine zone inclusively.—*Caucasus*: Eastern and Southern Transcaucasia, Talysh. *General distribution*: Armenia-Kurdistan, Iran. Described from northern Iran (Gilan). Type in Moscow?

25. **A. tenuifolia** Lam. Encycl. meth. I (1783) 26; DC. Prodr. VI, 31; Ldb. Fl. Ross. II, 2, 538; Grossh. Fl. Kavk. IV, 122 and Opred. Rast. Kavk. 455.—*A. tenuifolia* var. *albicaulis* Trautv. in Tr. Peterb. Bot. Sada, II (1873) 546.—*A. albicaulis* C.A.M. Verz. (1831) 76; Boiss. Fl. or. III, 270.—*Ik.*: Takhtajan and Fedorov, Atlas Ris. K. Fl. Erevana, Fig. 108.—*Exs.*: Pl. or. exs. No. 321.

Perennial. Rhizome thick, woody many-headed; stems numerous, hard, angular-sulcate, white or whitish, densely short- and appressed-tomentose, densely white-tomentose at base; erect, simple or branched (20)25–50(75) cm high. Leaves distant, more or less glabrous, linear, (1.5)2.0–3.0(5.0) cm long, pinnately cut; lower and middle cauline leaves with distant, usually ternate, less often entire, almost cylindrical segments, 1–3 mm long, with oblong-linear lobes having short cartilaginous apical cusp; segments in other narrow-linear leaves approximate, short, tooth-like; uppermost leaves filiform, usually entire. Capitula in compound, dense, usually many-flowered corymbs. Receptacle flat or convex. Involucre oblong-ovate, 3–4(5) mm long and 2–3 mm in dia; involucre bracts carinate, with prominent midrib; outer bracts sparsely floccose, ovate-deltoid, others glabrous or subglabrous, oblong, glaucous, with wide, transparent, white border; bracts almost as long as tubular florets, glabrous, lanceolate, with white-membranous border. Ligules of outer florets yellow, three-lobed or irregularly obtusely 3-toothed, small, a sixth to a fourth as long as involucre. Achenes oblong-cuneate, about 2 mm long. Flowering May to August (September).

If, however, one studies both genera as a whole or just a fairly large number of species of each genus, then the enumerated characters appear typical to the one genus as well as to individual members of the other genus. We will examine a few examples: most *Ptarmica* DC. species have large semiglobose capitula, whereas *P. ptarmicoides* (Maxim.) Worosch. has minute ovoid capitula and also usually very short ligules, bringing it closer to *Achillea* L. However, the other characters—shape and division of the leaf, winged achenes, link it inseparably to *Ptarmica* DC. Many *Ptarmica* DC. species have entire or weakly divided leaves, whereas *P. schuri* Sch. Bip. has ternately divided leaves, somewhat resembling the leaves of *Achillea* L., but the size of the semiglobose capitula, large ligules and winged achenes bring this species closer to *Ptarmica* DC. Many *Achillea* L. species have 5 or less ligulate florets each, but *A. cretica* L. and *A. armenorum* Boiss. and Hausskn. have 7–8 and up to 13 ligulate florets. Both these species have semiglobose capitula, whereas the capitula in most *Achillea* L. species are ovoid. Besides, *A. cretica* L. is characterized by very large, white ligules and
 105 winged achenes. All this brings these species close to *Ptarmica* DC. However, the leaf structure and other characters of the two species link them inseparably to the genus *Achillea* L. *A. borealis* Bong. has large ligules and winged achenes but approaches *Achillea* L. in the structure of the leaf and the fewer ligulate florets. Along with species having greatly divided leaves, the genus *Achillea* L. has a fairly large number of species with less divided leaves (for example, *A. filipendulina* Lam.). In other words, there is not a single character that would demarcate *Ptarmica* DC. as a separate genus from *Achillea* L. Not incidentally, therefore, *Ptarmica* DC. is recognized as a separate genus by very few taxonomists, mostly by those dealing with a small number of the species of this group. Therefore, I follow Koch and many other authors, and consider *Ptarmica* DC. only as a section of the genus *Achillea* L.

The distinguishing features of some species of section *Ptarmica* (DC.) Koch are not always well defined; the ranges of these species often overlap to considerably. Therefore, it would be more appropriate to consider them only as subspecies; however, according to the traditions established in the "Flora of the USSR," binomial names have been retained for them. Here, we have in mind on the one hand *A. salicifolia* Bess., *A. sedelmeyeriana* Sosn., *A. cartilaginas* Ldb. and *A. septentrionalis* (Serg.) Botsch., on the other, *A. biserrata* MB. and *A. griseo-virens* Alb.; yet another, *A. alpina* L., *A. ptarmicoides* Maxim., *A. japonica* Heimerl and some others.

Series 1. Lingulatae Botsch.—Leaves entire, toothed, obtuse; cauline leaves semiamplexicaul, basal and lowermost cauline leaves petiolate. Inflorescence corymbose, pubescence consisting of long, straight ferruginous hairs.

27. **A. lingulata** Waldst. and Kit. Descr. et Ic. Pl. rar. Hung. I (1799) 2, tab. 2; Boiss. Fl. or. III, 276; Heimerl in Denkschr. Acad. Wien. XLVIII, 151 (Monogr. sect. *Ptarmica*, 39); Popov, Ocherk Rast. i Fl. Karpat, 247; Klok. in Vizn. Rosl. URSR, 543.—*Ptarmica lingulata* DC. Prodr. VI (1837) 24.—Exs.: Fl. Hung. exs. No. 581.

Perennial. Rhizome creeping, with few stems; stems 20–50 cm high, erect, simple, branched only in inflorescence, leafy, glabrous below, sparsely pubescent above, in inflorescence densely covered with, long, ferruginous, soft, straight, squarrose hairs. Leaves green, entire, toothed, obtuse with ferruginous, long, soft, straight, squarrose hairs on margin and midrib beneath; basal leaves withering before flowering, obovate, petiolate, 2–4 cm long and 1.0–1.7 cm wide; petioles winged; lower cauline leaves oblanceolate, petiolate, 4–5 cm long and about 1.1 cm wide, with winged petioles; middle and upper cauline leaves oblong, semiamplexicaul. 1–4 cm long and 0.2–1.0 cm wide.
 106 Inflorescence compact, corymbose; capitula semiovoid, about 7 mm long and 7 mm in dia (excluding ligules). Involucral bracts imbricate, 3-seriate, lanceolate, 3.5–5.0 mm long, 0.75–1.5 mm wide, in middle part herbaceous, yellowish-green, with prominent midrib and rather densely pubescent with ferruginous, long, soft, erect, squarrose hairs; wide membranous border of involucral bracts dark brown, glabrous, fimbriate-toothed along margin. Receptacular scales like involucral bracts, reduced from periphery to center. Outer florets 7–9 pistillate, ligulate, about 6 mm long, with similar capitate glandular hairs along tube; ligules white, oval, about 4 mm long and 3.2 mm wide, with 3 obtuse teeth at apex; disk florets white, tubular, bisexual, about 3 mm long, covered with scattered capitate glandular hairs, five-lobed. Achenes oblanceolate, about 2 mm long and 1 mm wide, glabrous. Flowering June to August.

On peaks of the Carpathians, among rocks and subalpine meadows.—*European part*: Upper Dniester. *General distribution*: Central Europe, Balkans-Asia Minor. Described from several places in Romania. Type in Prague.

Series 2. Biserratae Botsch.—Leaves lanceolate, entire, biserrate. Inflorescence corymbose. Pubescence of long, straight, ferruginous hairs.

28. **A. biserrata** MB. Fl. taur.-cauc. II (1808) 334; Boiss. Fl. or. III, 275; Heimerl in Denkschr. Acad. Wien, XLVIII, 184 (Monogr. sect. *Ptermica*, 72); Grossh. Fl. Kavk. IV, 122; Mandenova, Fl. Gruzii, VIII, 322.—*Ptermica biserrata* DC. Prodr. VI (1837) 23; Ldb. Fl. Ross. II, 2, 529.—Exs.: Fl. Cauc. exs. No. 372.

Perennial. Rhizome creeping, with solitary stems; stems 35–100 cm high, straight, simple, branched only in inflorescence, leafy, sparsely pubescent below, rather densely above with ferruginous, long, soft, straight hairs. Leaves green, lanceolate, sessile, entire, biserrate, sparsely hairy along midrib on upper and lower surfaces like stem and also with numerous, more or less sessile, capitate glandular hairs on lower surface; lower leaves 0.6–5.0 cm long and 2.0–0.7 cm wide, withering before flowering; upper leaves 1.5–12.0 cm long and 0.2–1.8 cm wide. Inflorescence corymbose; capitula semiglobose, 5–8 mm long, 6–9 mm in dia (excluding ligules). Involucral bracts imbricate, 3-seriate, broadly lanceolate, 3.5–6.0 mm long and 1.5–2.2 mm wide, rather densely hairy like leaves, herbaceous in middle, yellowish-green with prominent midrib and wide membranous yellow border, dark brown fimbriate-dentate along margin. Receptacular scales like involucral bracts, reducing from periphery to centre. Outer florets 8, pistillate, ligulate, 7–8 mm long; ligules white, oval, 6–8 mm long and 4.0–6.5 mm wide, 107 with 3 obtuse teeth at apex; disk florets about 3.5 mm long, white, tubular, bisexual, 5-toothed, teeth acute. Achenes broadly oblanceolate, about 2.3 mm long and 1.3 mm wide. Flowering May to August.

In montane forests.—*Caucasus*: Ciscaucasia, Eastern and Western Transcaucasia. *General distribution*: Armenia-Kurdistan. Described from eastern part of Greater Caucasus. Type in Leningrad.

29. **A. griseo-virens** Alb. Mat. dlya Fl. Kolkhidy (1895) 133; Grossh. Fl. Kavk. IV, 122; Mandenova, Fl. Gruzii, VIII, 322, Fig. 388.—*A. biserrata* MB. var. *griseo-virens* Kolak. Fl. Abkhazia, IV (1949) 229.

Perennial. Rhizome creeping, with solitary stems; stem 35–80 cm high, leafy, branched in inflorescence and also with short nonflowering branches in axils; stems, both surface of leaves, involucral bracts and receptacular scales rather densely covered with ferruginous, long, soft, straight hairs. Leaves green or grayish-green, lanceolate, sessile, bidentate, with numerous, subsessile capitate glandular hairs beneath; lower leaves 1.5–5.0 cm long and 0.3–0.8 cm wide, withering before anthesis; upper leaves 1.5–7.0 cm long and 0.2–1.4 cm wide. Inflorescence corymbose; capitula semiglobose, 5–10 mm long, 6–10 mm in dia (excluding ligules). Involucral bracts imbricate, 3-seriate, broadly lanceolate, 3.5–6.0 mm long, 2–3 mm wide, herbaceous in

middle, yellowish-green with prominent midrib and broad membranous-yellow border, dark brown, fimbriate-toothed along margin. Receptacular scales like involucre bracts, reducing from periphery to center. Outer florets 8, pistillate, ligulate, 7–10 mm long; ligules white, oval, 5–8 mm long and 4.0–5.5 mm wide, with 3 obtuse teeth at apex; disk florets about 3.5 mm long, white, tubular, bisexual, 5-toothed, teeth acute. Achenes broadly oblanceolate, about 2.5 mm long and 1.5 mm wide. Flowering May to September.

In subalpine and alpine meadows.—*Caucasus*: Ciscaucasia, Western Transcaucasia. Endemic. Described from western part of Greater Caucasus. Type in Tbilisi.

Note. *A. griseo-virens* Alb. is described from two localities. The plant with the following label should be considered as the lectotype: “*Circassia: in pratis alpinis jugi Khag-Kytzyrkha (Khach-Katsyrka)* 1894, No. 221, N. Alboff,” preserved in the herbarium of the Tbilisi Botanical Institute, Academy of Sciences of the Georgian SSR.

A. griseo-virens Alb. is very close to *A. bisserrata* MB. Unlike the latter, *A. griseo-virens* Alb. has pubescence on both sides of the leaves and short nonflowering branches in the leaf axils.

Series 3. *Ptarmicae* Botsch.—Leaves linear or lanceolate, entire, toothed or bidentate, glabrous or pubescent, hairs colorless, straight, short. Inflorescence corymbose.

- 108 30. ***A. ptarmica*** L. Sp. pl. (1753) 898; Boiss. Fl. or. III, 274; Klok. in Vizn. Rosl. URSR, 543.—*Ptarmica integrifolia* Gilib. Fl. Lithuan. III (1782) 216.—*P. vulgaris* Blakw. ex DC. Prodr. VI (1837) 23 p. p.—*P. vulgaris* Clus. ex Ldb. Fl. Ross. II, 2 (1845) 529.—*Achillea ptarmica* L. ssp. *euptarmica* Heimerl var. *genuina* Heimerl in Denkschr. Acad. Wien, XLVIII (1884) 173 (Monogr. sect. *Ptarmica*, 61).— **Ic.**: Syreitsch. Ill. Fl. Mosk. Gub. III, 262; Hegi, Ill. Fl. VI, 2, fig. 290; tab. 264, fig. 1.— **Exs.**: GRF No. 672.

Perennial. Rhizome creeping, with solitary stem; stem 20–125 cm high, leafy, simple, branched only in inflorescence or with short nonflowering branches in leaf axils, glabrous below, sparsely pubescent in middle with short, curly, colorless hairs, densely above. Leaves green, linear or linear-lanceolate, sessile; bidentate; lower glabrous, uppermost on both sides or only beneath hairy along midrib, hairs long, soft, erect, colorless, scattered; lower leaves 1.0–8.5 cm long, and 1–6 mm wide, withering before flowering, upper 0.7–9.0 cm long and 1.0–6.5 mm wide. Inflorescence corymbose, capitula semiglobose, 5.0–6.5 mm long, 7–9 mm in dia (excluding ligules). Involucre bracts imbricate, three-seriate, broadly lanceolate, 2.5–4.0 mm long and 1.2–

1.5 mm wide, with broad green central part, bordered with dark brown, membranous, ciliate-toothed frill, densely covered with colorless straight or flexuous, short, appressed hairs. Receptacular scales apically dark brown, like involucre bracts, reducing from periphery to center; outer florets 6–10; pistillate, ligulate, 3.0–6.5 mm long; ligules white, pigmented violet at base or less often white throughout, oval, 1.8–5.0 mm long and 1.2–4.5 mm wide, with 3 obtuse teeth at apex; disk florets 2.2–2.5 mm long, white, tubular bisexual, 5-toothed, teeth acute. Achenes broadly oblanceolate, about 1.5 mm long and 0.8 mm wide. Flowering July to August.

In meadows, along riverbanks and among shrubs.—Arctic: Arctic Europe; *European part*: Karelia-Lapland, Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Volga-Don, Upper Dniester; *Western Siberia*: Ob River Area (introduced?). *General distribution*: Scandinavia, Central Europe, Atlantic Europe, Western Mediterranean, Balkans. Described from temperate Europe. Type in London.

Note. Sometimes specimens of *A. ptarmica* L. with double capitula are found where most of the florets are ligulate and only a few tubular. Such plants are often cultivated.

31. **A. acuminata** (Ldb.) Sch. Bip. in Flora, XXXVIII (1855) 15.—*Ptarmica acuminata* Ldb. Fl. Ross. II, 2 (1845) 529.—*P. vulgaris* Blakw. ex DC. Prodr. VI (1837) 23 p. p.; Turcz. in Bull. Soc. Nat. Mosc. XXV, 431.—*Achillea ptarmica* L. ssp. *euptarmica* Heimerl var. *acuminata* Heimerl in Denkschr. Acad. Wien. XLVIII (1884) 173 (Monogr. sect. *Ptarmica*, 61); Kitam. Compos. Japon. II, 322.—*A. ptarmica* L. ssp. *macrocephala* Heimerl var. *angustifolia* Heimerl in Denkschr. Acad. Wien, XLVIII (1884) 176.—*A. acuminata* Freyn in Oest. Bot. Zeitschr. XLV (1895) 344.—*A. ptarmica* auct. non L. (1753); Kom. and Alis. Opređ. Rast. Dal'nevost. Kr. II (1932) 1027.—*Ptarmica speciosa* auct. non DC. (1837); Popov, Fl. Sib. II (1959) 726.

Perennial. Rhizome short?; stems solitary or few, 25–130 cm high, leafy, simple, branched only in inflorescence or with short nonflowering branches in leaf axils, glabrous below, sparsely in middle and in part densely pubescent above with short, curly, colorless hairs. Leaves green, lanceolate or linear-lanceolate, sessile, biserrate; lower leaves glabrous, uppermost scatteredly pubescent on midrib on both sides or only beneath with short, soft, straight, colorless hairs; lower leaves 0.7–10.0 cm long and 0.5–9.0 mm wide, withering before flowering; upper leaves 1–11 cm long and 4.5–9.0 mm wide. Inflorescence corymbose; capitula semiglobose, 4.0–7.5 mm long and 4.5–9.0 mm in dia (excluding ligules). Involucre bracts imbricate, 3-seriate, 2.3–4.5 mm long and

1.2–1.7 mm wide, with narrow yellowish-green central part, bordered with wide, yellow, ciliate-toothed frill along membranous margin, sometimes membranous frill light brown, not densely pubescent with colorless, straight or flexuous, short, appressed hairs. Receptacular scales apically yellowish, like involucre bracts, reducing from periphery to center. Outer florets 10–23, pistillate, ligulate, 4.0–9.7 mm long; ligules white, oval, 3–8 mm long and 2.5–5.5 mm wide, with 3 obtuse teeth at apex; disk florets 2–3 mm long, white, tubular, bisexual, 5-toothed; teeth acute. Achenes broadly oblanceolate, about 2.5 mm long and 1 mm wide. Flowering June to September.

In meadows, riverine sands, riverbanks and among shrubs.—*Eastern Siberia*: Lena-Kolyma, Dauria; *Far East*: Zeya-Bureya, Uda River Area, Ussuri, Sakhalin. *General distribution*: Mongolia, Japan, China. Described from Trans-Baikal Region. Type in Leningrad.

Note. *A. acuminata* (Ldb.) Sch. Bip. is close to the European species *A. ptarmica* L., replacing it in Asia. *A. acuminata* (Ldb.) Sch. Bip. differs from *A. ptarmica* L. in the color and number of ray florets, color of the involucre bracts and receptacular scales, as well as the leaf shape.

32. ***A. ptarmicifolia*** (Willd.) Rupr. ex Heimerl in Denkschr. Acad. Wien, XLVIII (1884) 127 (Monogr. sect. *Ptarmica*, 15) in clave.—*Pyrethrum ptarmicaefolium* Willd. Sp. pl. III, 3 (1804) 2151.—*Chrysanthemum ptarmicaefolium* Mus.-Puschkin ex Willd. l. c.; in syn.—*Anthemis ptarmicaefolia* Adam in Weber and Mohr, Beitr. Naturk. I (1805) 71.—*Achillea leucanthema* Persoon, Syn. II (1807) 467.—*A. grandiflora* MB. Fl. taur.-cauc. II (1808) 333; Boiss. Fl. or. III, 275; Grossh. Fl. Kavk. IV, 122; Mandenova, Fl. Gruzii, VIII, 325, Fig. 390.—*A. dracunculoides* Desf. Hort. Paris (1829) 180.—*Ptarmica*
 110 *grandiflora* DC. Prodr. VI (1837) 23; Ldb. Fl. Ross. II, 2, 531.—*Achillea ptarmica* L. ssp. *ptarmicaefolia* Heimerl var. *grandiflora* Heimerl op. cit. 178. (Monogr. 66).—*A. ptarmica* L. ssp. *ptarmicaefolia* Heimerl var. *ruprechtiana* Heimerl op. cit. 78 (Mongr. 66).

Perennial. Rhizome creeping, usually with few stems; stems 15–60 cm high, leafy, branched inflorescence and with long nonflowering branches in leaf axils, glabrous below, in middle part sparsely and above rather densely pubescent with colorless, short, crisped hairs. Leaves green, linear, scatteredly pubescent beneath with colorless straight hairs; lower leaves 2.5–7.0 cm long, 1.5–4.0 mm wide, biserrate, withering before flowering; upper leaves and those of axillary branches 1–10 cm long, 1–5 mm wide, toothed. Inflorescence corymbose; capitula semiglobose, 4.5–7.0 mm long and 6.5–9.0 mm in dia (excluding ligules). Involucre bracts imbricate, 3-seriate, broadly lanceolate, 2.3–

4.0 mm long and 1.0–1.8 mm wide, with scattered not very long crisped colorless hairs, fimbriate-toothed along margin, yellowish-green in middle, with wide, membranous, light brown frill along margin. Receptacular scales like involucre bracts, reducing from periphery to center. Outer florets 8–12, pistillate, ligulate florets 5.2–10.0 mm long; ligules white, oval, 7–9 mm long and 2.5–3.7 mm wide, with three obtuse teeth at apex, disk florets 2.7–3.0 mm long, white, tubular, bisexual, 5-toothed; teeth acute. Achenes broadly oblanceolate, about 2.8 mm long and 1.6 mm wide. Flowering July to August.

On screes and rocks in subalpine and alpine zones.—*Caucasus*: Ciscaucasia, Eastern and Western Transcaucasia. Endemic. Type in Berlin; isotype in Leningrad.

Note. *A. ptarmicifolia* (Willd.) Rupr. ex Heimerl is characterized by rather long non-flowering axillary branches. Sometimes some branches in some specimens of *A. ptarmicifolia* (Willd.) Rupr. ex Heimerl bear solitary capitula. These specimens would remove the boundary between *A. ptarmicifolia* (Willd.) Rupr. ex Heimerl and *A. sachokiana* Sosn., if it were not for the pubescence on the leaves, branches, involucre bracts, and receptacular scales, typical of the former species.

Sometimes *A. ptarmicifolia* (Willd.) Rupr. ex Heimerl hybridizes with *A. biserrata* MB.

33. ***A. sachokiana*** Sosn. in Tr. Azerb. Otd. Zakavk. Fil. Akad. Nauk SSSR, Sek. Bot. (1933) 46, fig.; Grossh. Fl. Kavk. IV, 122.

Perennial. Entirely glabrous plants. Rhizomes creeping; stems ascending, 15–30 cm high, leafy, branched; main stem with corymbose inflorescence, cauline branches often with solitary capitula. Leaves green, broadly lanceolate, toothed, sessile, 0.5–1.5 cm long and 1–5 mm wide; lower leaves withering early. Capitula semi-globose, about 7 mm long and 9 mm dia, elongate. Involucre bracts imbricate, 3-seriate, broadly lanceolate, 3–5 mm long and 1.0–2.8 mm wide, green in middle, with wide membranous dark-brown border, fimbriate-toothed in upper part. Receptacular scales, like involucre bracts, reducing from periphery to center. Outer florets 8, pistillate, ligulate, about 8 mm long; ligules white, oval, about 6.5 mm long and 5.5 mm wide, with 3 obtuse teeth at apex; disk florets about 4 mm long, white, tubular, bisexual, 5-toothed, teeth acute. Achenes broadly oblanceolate, about 3.2 mm long and 1.5 mm wide. Flowering July to August.

In alpine zone on stony places.—*Caucasus*: Eastern Transcaucasia. Endemic. Described from mountainous pastures in the vicinity of Shemakhi. Type in Tbilisi; isotype in Leningrad.

Note. *A. sachokiana* Sosn. is known to me only from one locality, the place of origin of the type specimen. It differs from *A. ptarmicifolia* (Willd.) Rupr. ex Heimerl by a complete absence of pubescence, shorter and broader leaves, and in that the axillary branches are not nonflowering but usually terminate in solitary capitula.

34. *A. macrocephala* Rupr. in Mater. k Blizh. Pozn. Prozyabaemosti Ross. Imper. 2 (1845) 41; ejusd. Fl. samojed. cisur. (1846) 41; Heimerl in Denkschr. Acad. Wien, XLVIII, 127 (Monogr. sect. *Ptarmica*, 15) in clave.—*A. ptarmica* L. var. *speciosa* Herd. in Bull. Soc. Nat. Mosc. XXXVIII (1865) 407, non *A. speciosa* Henckel (1806).—*A. ptarmica* L. ssp. *macrocephala* Heimerl var. *angustifolia* Heimerl op. cit. 176 (Monogr. 64) p. p.—*A. ptarmica* L. ssp. *macrocephala* Heimerl var. *latifolia* Heimerl op. cit. 177 (Monogr. 65); Hultén, Fl. Kamtch. IV, 167; Kitam. Compos. Japon, II, 322.—*A. ptarmica* L. var. *beringiana* Trautv. in Tr. Peterb. Bot. Sada, IX, 2 (1886) 447.—*Ptarmica macrocephala* Kom. Fl. Kamch. III (1930) 137 and Izbr. Soch. VIII: II (1951) 437.

Perennial. Rhizome short; stems solitary or few, 25–100 cm high, leafy, erect, branched in inflorescence and, also with short nonflowering branches in leaf axils; glabrous below, in middle part sparsely and above densely pubescent with short, curly, colorless hairs. Leaves green, lanceolate or broadly-lanceolate, sessile, biserrate, lower leaves glabrous, middle beneath, and upper on both sides pubescent on midrib with scattered, colorless, erect hairs; lower leaves 2.5–8.0 cm long, 2.5–8.0 mm wide, withering before flowering; upper leaves 0.8–9.0 cm long, 2–10 mm wide. Inflorescence corymbose; capitula semiglobose, 6–8 mm long and 8–11 mm in dia (excluding ligules). Involucral bracts imbricate, 3-seriate, 3–5 mm long, 1.7–2.0 mm wide, with broad green central part, bordered with dark brown membranous margin, densely or sparsely covered dorsally with colorless, rather long, curly hairs, margins fimbriate-toothed. Receptacular scales dark
112 brown at apex, like involucral bracts, reduced from periphery to center, outer florets 8–14, pistillate, ligulate, 7.2–10.0 mm long; ligules white, sometimes violet at base, oval, 5.6–9.0 mm long and 4.5–6.0 mm wide, with 3 obtuse teeth at apex; disk florets 2.2–2.7 mm long, white, tubular, bisexual, 5-toothed, teeth acute. Achenes broadly oblanceolate, about 2.4 mm long and 1 mm wide. Flowering July to September.

Along riverbanks, in willow stands, along gravel beds and in meadows near rivers.—*Far East*: Kamchatka (Commander and Kuril islands). *General distribution*: Japan. Described from the vicinity of Petropavlovsk-Kamchatsky (Martens). Type in Leningrad.

Series 4. Salicifoliae Botsch.—Leaves lanceolate, entire, biserrate, punctate-glandular hairy on both sides, or not; also covered with short, curly, colorless hairs. Inflorescence corymbose.

35. **A. salicifolia** Bess. Suppl. Catal. pl. Jard. Botan. Krzemieniec (1812) 3.—*Ptarmica vulgaris* DC. var. *pycnocephala* Trautv. in Bull. Nat. Mosc. XXXIX, 2 (1866) 345.—*P. vulgaris* Clus. var. *cartilaginea* DC. in B. and O. Fedtsch. Perech. Rast. Turkest. IV (1911) 181.—*Achillea borystenica* Klok. in Vizn. Rosl. URSR (1950) 543, nom. subnud.—*A. cartilaginea* Ldb. ssp. *borystenica* Sakalo, in Vizn. Rosl. URSR (1950) 543, in syn.—*Ptarmica borystenica* Klok. and Sakalo in Bot. Mat. Gerb. Bot. Sada, XVI (1954) 357.

Perennial. Rhizome short, plants usually grayish-green, densely covered with short crisped hairs; stems erect, 20–100 cm high, leafy, branched; branches usually short, nonflowering, only uppermost, and sometimes also middle branches, bearing capitula. Leaves 0.7–10.5 cm long, 1–13 mm wide, reduced from base to stem apex, sessile, linear-lanceolate, entire, biserrate, slightly involute, punctate-glandular hairy on both sides; lower cauline leaves withering before flowering. Inflorescence corymbose; capitula usually many-flowered, semiovate, 4.0–5.5 mm long and 3.5–5.0 mm in dia (excluding ligules). Involucre imbricate, 3-seriate; involucre bracts 2–3 mm long, 1.25–1.5 mm wide, broadly lanceolate, herbaceous in middle, yellowish-green, with prominent midrib, membranous on margin, yellow or yellow with dark brown border. Receptacular scales like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, 2.0–4.25 mm long; tube with isolated capitate glandular hairs; ligules white or white with violet base, oval, 1–3 mm long, 1.3–3.25 mm wide, with three obtuse teeth at apex; disk florets 5-toothed, white, tubular, bisexual, 1.5–2.6 mm long, with solitary capitate glandular hairs. Achenes oblong or oblanceolate, 1.0–1.5 mm long and 0.75–1.0 mm wide, glabrous. Flowering June to August.

Along banks of rivers and lakes, in meadows and marshes, birch stands.—*European part*: Dvina-Pechora (introduced), Upper Volga, Upper Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga Region, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Western Siberia*: Ob River Area, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Lena-Kolyma, Angara-Sayans; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Dzhungaria-Tarbagatai. *General distribution*: Central Europe. Described from Dniester. Type in Leningrad.

Note. *Ptarmica borystenica* Klok. and Sakalo was described in 1954. The authors distinguished their species from *P. cartilaginea*

Ldb. by a series of characters. These species should be differentiated, although the border between them is not always distinct. In the note to their species, M.V. Klovov and D.I. Sakalo say that while examining the authentic material of *Achillea salicifolia* Bess. preserved in Kiev, they could not distinguish it from *Ptarmica cartilaginea* Ldb., and suggested that, apparently, preference should be given to the name proposed by Besser as having priority. I cannot agree with this, as it contradicts the facts. The plant from Dniester, which was labeled as *Achillea salicifolia* Bess. in Besser's own hand, is being preserved in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR. This specimen should be designated as the lectotype of the species. The lectotype of *A. salicifolia* Bess. differs from the type specimen of *Ptarmica cartilaginea* Ldb. particularly in those traits by which *P. borystenica* Klok. and Sakalo was characterized. Therefore, the description of *P. borystenica* Klok. and Sakalo was superfluous, and the name must be considered a synonym of *Achillea salicifolia* Bess. As regards *Ptarmica cartilaginea* Ldb., this is a separate, closely related species of the genus *Achillea* L.

36. **A. sedelmeyeriana** Sosn. in Schedis herb. "Pl. orient. exs.," fasc. IX–XVI (1928) 7 and in Zhurn. Russk. Bot. Obshch. XIV, 1 (1929) 82; Grossh. Fl. Kavk. IV, 121; Mandenova, in Fl. Gruzii, VIII, 325, Fig. 389.—Exs.: Pl. or. exs. No. 221.

Perennial. Plants grayish-green, densely covered with short, curly hairs; stems erect, 50–65 cm high, leafy, branched; lower branches short, nonflowering, upper terminating in capitula. Leaves 0.6–6.0 cm long and 1–6 mm wide, reducing from base to stem apex, sessile, linear-lanceolate, entire, biserrate, somewhat involute, punctate-glandular-hairy on both sides; lower leaves withering before flowering. Inflorescence corymbose, capitula semiglobose, about 4 mm long and 4 mm in dia (excluding ligules). Involucre imbricate, 3-seriate; involucre bracts 2.2–3.5 mm long, 1.0–1.5 mm wide, broadly lanceolate, herbaceous in middle, green with prominent midrib, membranous along margin, dark brown. Receptacular scales like involucre bracts, reduced from periphery to center, outer florets 8, pistillate, ligulate, about 4 mm long, with isolated capitate glandular hairs along tube; ligules white, oval, about 2.5 mm long and 2.2 mm
114 wide, with 3 obtuse teeth at apex, disk florets white, 5-toothed, tubular, bisexual, about 2 mm long, with isolated capitate glandular hairs. Flowering June.

Humid places in middle mountain zone.—*Caucasus*: Western Transcaucasia. Endemic. Described from Dzhevakheta (village of Gorolovka). Type in Tbilisi; isotype in Leningrad.

Note. *A. sedelmeyeriana* Sosn. occupies an intermediate position between *A. cartilaginea* Ldb. and *A. salicifolia* Bess. It is closely related to the former species by the dark brown margin of the involucre bracts, and to the latter species by the dense pubescence and involute leaves. The range of *A. sedelmeyeriana* Sosn. is disjunct from the ranges of both these species.

37. **A. cartilaginea** Ldb. in Rchb. Fl. Germ. exc. III (1832) 849.—*Ptarmica ircutiana* DC. Prodr. VI (1837) 22; Ldb. Fl. Ross. II, 2, 529.—*P. vulgaris* Blackw. δ . ?*cartilaginea* DC. Prodr. VI (1837) 23.—*P. speciosa* DC. Prodr. VI (1837) 23; Ldb. Fl. Ross. II, 2, 530 p. p.—*P. cartilaginea* Ldb. Fl. Ross. II, 2 (1845) 530; Sergievskaya, in Fl. Zap. Sib. XI, 2728.—*Achillea cartilaginea* Ldb. Ind. hort. dorpat. sec. Ldb. Fl. Ross. II (1845) 530, in syn.; Boiss. Fl. or. III, 274; Heimerl in Denkschr. Acad. Wien, XLVIII, 127 (Monogr. 15), in clave.—*A. speciosa* Henckel β . *occidentalis* Rupr. in Mater. Blizh. Pozn. Prozyabaemosti Ross. Imper. 2 (1845) 41; ejusd. Fl. samojed. cisur, 1846 (41).—*Ptarmica lenensis* Turcz. in Bull. Soc. Nat. Mosc. XXV, 4 (1852) 431. *Achillea lenensis* Turcz. in Bull. Soc. Nat. Mosc. XXV, 4 (1852) 431.—*A. ircutiana* Sch. Bip. in Flora, XXXVIII (1855) 15.—*A. cartilaginea* Ldb. var. *latifolia* Rupr. Fl. Ingr. (1860) 587.—*A. ptarmica* L. ssp. *cartilaginea* Heimerl, op. cit. 174 (Monogr. 62).—*A. cartilaginea* Boiss. ex Grossh. Fl. Kavk. IV (1934) 122 p. p. quoad nom.; Klok. in Vizn. Rosl. URSR, 543.—*A. speciosa* auct. non Spreng. (1806); Ldb. Fl. Alt. IV (1833) 122.—**Ис.**: Syreistsch. III. Fl. Mosk. Gub. III, 263.—**Exs.**: GRF No. 822.

Perennial. Rhizome short; plants green, sparsely pubescent from curly hairs; stems erect, 20–150 cm high, leafy, branched, lower branches short, nonflowering, middle and upper long, terminating in capitula. Leaves punctate-glandular hairy on both sides, sessile, flat, lanceolate, entire, biserrate-dentate, reduced from stem base to apex, 0.2–12.0 cm long, 0.5–17.0 mm wide, lower leaves withering before flowering. Inflorescence corymbose; capitula usually numerous, semiglobose, 3–5 mm long and 3–5 mm in dia (excluding ligules). Involucre imbricate, 3-seriate; involucre bracts 1.8–4.1 mm long and 1.0–2.2 mm wide, broadly lanceolate, herbaceous in middle part, green, with prominent midrib, membranous on margin, dark brown. Receptacular scales, like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, 4.7–5.7 mm long; tube with isolated capitate glandular hairs; ligules white or white with violet
115 base, oval, 3.0–4.2 mm long and wide, with 3 obtuse teeth at apex; disk florets 5-toothed, white, tubular, bisexual, 2.1–2.7 mm long, with solitary capitate glandular hairs. Achenes oblong or oblanceolate, 1.8–2.1 mm long and 1.0–1.1 mm wide. Flowering June to August.

Along banks of rivers and lakes, in meadows and marshes, coastal scrubs and coastal sands.—*Arctic*: Arctic Europe, Arctic Siberia; *European part*: Karelia-Lapland, Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga Region, Bessarabia, Black Sea Region, Lower Don, Lower Volga; *Western Siberia*: Ob River Area, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans; *Far East*: Sakhalin (introduced?); *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region. *General distribution*: Scandinavia, Central Europe. Described from Lithuania. Type in Leningrad.

Note. This species should perhaps be more appropriately called *A. speciosa* Spreng. in Henckel, *Adumbr. plant* (1806) 1. However, certain facts go against it. All specimens of *A. speciosa* Spreng. preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, were raised in different botanical gardens in the first half of the 19th century. There are no plants collected under natural conditions, and also in the description of the species it is stated that its native country is unknown. The specimens are tall plants with thick angular stems, large punctate-glandular leaves, and large capitula. There are no such large plants among the materials of *A. cartilaginea* Ldb. preserved in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR, and collected under natural conditions. Besides, as was mentioned above, all the plants identified as *A. speciosa* Spreng. have leaves covered with punctate-glandular hairs, whereas this character is not mentioned in the original description of *A. speciosa* Spreng., and I did not have the type specimen at my disposal. Therefore, the species under consideration is named *A. cartilaginea* Ldb., and the species name *A. speciosa* Spreng. should be reserved for the large plants cultivated in botanical gardens.

38. *A. septentrionalis* (Serg.) Botsch. comb. nova.—*Ptarmica cartilaginea* Ldb. ssp. *septentrionalis* Serg. in Fl. Zap. Sib. XI (1949) 2728.—*Achillea ptarmica* L. *speciosa* Schmalh. Fl. II (1897) 63, non *A. speciosa* Henckel (1806).—*Ptarmica speciosa* Stank. in Stank. and Taliev, Opred. (1949) 626.—*P. speciosa* auct. non DC. (1837); Ldb. Fl. Ross. II, 2, 530 p. p.

Perennial. Rhizome short, plants green, sparsely pubescent from curly hairs, or stem and leaves glabrous and inflorescence branches and involucre bracts pubescent; stem erect, 30–125 cm high, leafy, simple, branched only in inflorescence or throughout, and then lower branches reduced, nonflowering, upper terminating in capitula. Leaves 116 0.3–11.0 cm long and 0.5–22 mm wide, reduced from the base to stem

apex, sessile, linear-lanceolate, entire, biserrate-dentate, flat, lacking punctate glandular hairs; lower leaves withering before anthesis. Inflorescence corymbose; capitula semiglobose, 6–7 mm long, 4–6 mm in dia (excluding ligules), Involucre imbricate, 3-seriate; involucre bracts 2.5–3.8 mm long, 1.2–1.7 mm wide, broadly lanceolate, herbaceous in middle, green, with prominent midrib, membranous on margin, dark brown. Receptacular scales like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, 4.7–6.0 mm long with isolated capitate glandular hairs along tube; ligules white throughout or with violet base, oval, 3.2–4.0 mm long and 2.4–3.2 mm wide; with 3 obtuse teeth at apex; disk florets white, 5-toothed, tubular, bisexual, 2.5–3.0 mm long, with capitate glandular hairs. Achenes oblanceolate, about 2.4 mm long, 1.2 mm wide. Flowering June to August.

In flooded meadows, along riverbanks among shrubs and flood-plain forests.—*European part*: Dvina-Pechora, Upper Volga, Volga-Kama, Upper Dnieper, Volga-Don, Lower Volga; *Western Siberia*: Ob River Area. Endemic. Described from several places in Western Siberia. Type in Tomsk.

Note. *A. septentrionalis* (Serg.) Botsch. is similar to *A. cartilaginea* Ldb., especially to individuals that grew in very humid conditions and have weakly pubescent leaves. However, unlike these plants, *A. septentrionalis* (Serg.) Botsch. does not have punctate-glandular hairs on leaves. Earlier it was believed that *A. speciosa* Spreng. had the combination of characters listed above, and our plant was so identified. However, it would now be more appropriate to consider that *A. speciosa* Spreng. has punctate-glandular hairy leaves and is a unique garden form close to *A. cartilaginea* Ldb. As for plants with eglandular leaves, they are placed in the separate species—*A. septentrionalis* (Serg.) Botsch.

Series 5. Alpinae Botsch.—Leaves pinnatifid or pinnately cut, with punctate glandular hairs above or without them, but with long colorless straight hairs. Inflorescence corymbose.

39. ***A. impatiens*** L. Sp. pl. (1753) 898; Ldb. Fl. Alt. IV, 123; Heimerl in Denkschr. Acad. Wien. XLVIII, 127 (Monogr. sect. *Ptarmica*, 15) in clave.—*Ptarmica impatiens* DC. Prodr. VI (1837) 22; Ldb. Fl. Ross. II, 2, 527; Turcz. in Bull. Soc. Nat. Mosc. XXV, 429; Sergievskaya in Fl. Zap. Sib. XI, 2731; Popov, Fl. Sr. Sib. II, 725.—*Achillea impatiens* L. ssp. *euimpatiens* Heimerl op. cit. 185 (Monogr. 73) p. p., excl. pl. transsilvanicae.—**Exs.**: GRF No. 1117.

Perennial. Rhizome short; stem erect, 35–130 cm high, leafy, branched only in inflorescence, glabrous below, in middle sparsely and in upper part and inflorescence densely covered with colorless, rather long, appressed straight hairs. Leaves sessile, lanceolate, green, glabrous above, with colorless, scattered, appressed, straight hairs beneath, 1–7 cm long, 2–20 mm wide, pinnately cut, segments usually distant, slightly longer than wide, linear; upper leaves entire, lower with 1–2 linear teeth closer to base of upper margin and sometimes (mainly in lowermost leaves) with 1–2 smaller deltoid teeth at base of lower margin; segments and teeth serrulate-denticulate; teeth and apex cartilaginous-cuspidate; lower leaves withering before flowering. Inflorescence corymbose; capitula semiglobose, 4–7 mm long and 4–7 mm in dia (excluding ligules). Involucre imbricate, 3-seriate; involucre bracts 2.2–4.0 mm long and 1.3–1.6 mm wide, broadly lanceolate, with scattered, rather long, appressed straight, colorless hairs, in middle herbaceous, green with prominent midrib, membranous on margin, dark brown or yellow, with dark brown border. Receptacular scales, like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, 5.3–6.6 mm long, with isolated capitate glandular hairs along tube; ligules oval, white throughout or with violet base, less often violet, 3.5–4.7 mm long and 3.2–6.0 mm wide, with 3 rather large obtuse teeth at apex; disk florets white, 5-toothed, tubular, bisexual, 2.7–3.2 mm long, with isolated capitate glandular hairs. Achenes about 2.2 mm long and 1 mm wide. Flowering June to August.

In montane and plain forests, forest meadows.—*Arctic*: Arctic Siberia; *Western Siberia*: Ob River Area, Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria. *General distribution*: Dzhungaria-Kashgaria?, Mongolia?. Described from Siberia. Type in London.

Note. *A. spinosa* Schur, which is very closely related to the Siberian species *A. impatiens* L., grows near the city of Cluj in Romania. It differs from *A. impatiens* L. by taller stems and a larger number of teeth on the lower segments of the leaves (2–4 and not 1–2 on each side), which was noted even in the original description. Most authors have without basis combined *A. spinosa* Schur and *A. impatiens* L.

40. *A. ledebouri* Heimerl in Flora (1883) 389; ej. in Denkschr. Acad. Wien, XLVIII, 127 (Monogr. sect. *Ptarmica*, 15) in clave.—*A. impatiens* L. ssp. *ledebouri* Heimerl op. cit. (1884) 127, 184 (Monogr. 15, 74).—*Ptarmica krylovii* Serg. in Sistemat. Zam. Gerb. Toms. Univ. 1–2 (1949) 13 and in Fl. Zap. Sib. XI, 2730.—*P. tenuisecta* (Kryl.) Serg. in Sistemat. Zam. Gerb. Toms. Univ. 1–2 (1949) 13 and in Fl. Zap. Sib. XI, 2730.—*P. alpina* DC. f. *tenuisecta* Kryl. sec. Serg. in

Sistemat. Zam. Gerb. Tomsk. Univ. 1-2 (1949) 13 and in Fl. Zap. Sib. XI, 2731.—*Achillea alpina* auct. non L. (1753); Ldb. Fl. Alt. IV (1833) 123.—*Ptarmica alpina* auct. non DC. (1837); Ldb. Fl. Ross. II, 2, 528; Kryl. Fl. Alt. III, 614.

- 118 Perennial. Rhizome rather long, horizontal; stem erect, 20-75 cm high, leafy, usually branched only in inflorescence, glabrous below, in middle sparsely and in inflorescence densely covered with rather long, appressed, straight, colorless hairs. Leaves 0.5-5.2 cm long, 2-11 mm wide, sessile, lanceolate, pinnately lobed, pinnately parted, or pinnately cut, with scattered, rather long, appressed, straight, colorless hairs on both sides; lobes, or segments, linear, acute, distant, at a distance more or less equaling their width, serrulate-denticulate, sometimes with a large tooth on upper margin, cartilaginous-cuspidate at apices and teeth; lower leaves withering before flowering. Inflorescence corymbose; capitula fewer, semiglobose, 6-7 mm long and 6-7 mm in dia (excluding ligules). Involucre imbricate, 3-seriate; involucre bracts 3.1-5.0 mm long and 1.6-2.0 mm wide, broadly lanceolate, with scattered, rather long, straight, appressed colorless hairs, herbaceous in middle, green, with prominent midrib, membranous on margin, dark-brown. Receptacular scales, like involucre bracts, reduced from periphery to center. Outer florets 8-pistillate, ligulate, 6.2-8.5 mm long, glabrous; ligules white, oval, 4.5-6.0 mm long, 3.5-5.5 mm wide, with 3 obtuse apical teeth; disk florets white, 5-toothed, tubular, bisexual, 3.2-3.3 mm long, glabrous. Achenes broadly lanceolate, 2.1-2.7 mm long and 0.8-1.0 mm wide. Flowering July to August.

In alpine and subalpine meadows.—*Western Siberia*: Altai. *General distribution*: Dzhungaria-Kashgaria. Described from Altai. Type in Vienna; isotype in Leningrad.

Note. It was customary to call this species *A. alpina* L. (see Ldb. Fl. alt. IV, 123). However, the description of the species by Linnaeus did not correspond to the Altai plants, as indeed shown by Heimerl (l. c. 1883), who described the Altai plants, accepted by Ledebour as *A. alpina* L., as a new species—*A. ledebouri* Heimerl. Later, Heimerl (l. c. 1884) considered his species as a subspecies of *A. impatiens* L. and drew attention to the fact that the material used by him as type material for describing the new species (Karelin and Kirilov, 1840, No. 782) also included typical *A. impatiens* L.

L.P. Sergievskaya described *Ptarmica krylovii* Serg. and *P. tenuisecta* Serg. (l. c.) from Altai. Besides the type specimens of these species, I have studied a fairly large number of plants and am convinced of the following:

1. Even the isotypes of *A. krylovii* Serg., contrary to the description, show various degrees of leaf incision (from pinnatilobate to pinnatisect).

Besides, the segments of more divided leaves sometimes also have large teeth together with minute teeth; in other words, even the isotypes of *P. krylovii* Serg. have characters of both the "species" described by
 119 L.P. Sergievskaya. Re-examination of the entire material would convince one about the impossibility of dividing it into two species.

2. The plants described by L.P. Sergievskaya as two different species are indistinguishable from the type species *Achillea ledebouri* Heimerl.

A. ledebouri Heimerl, apparently, sometimes hybridizes with *A. impatiens* L., which explains the large variation in the degree of leaf incision in the former species.

41. *A. alpina* L. Sp. pl. (1753) 899; Willd. Sp. pl. III, 3, 2193 p. p. quoad pl. sibiricam.—*A. mongolica* Fisch. ex Spreng. Novi proven hort. Acad. Halen. et Berol. (1818) 3; Heimerl in Denkschr. Acad. Wien, XLVIII, 127 (Monogr. sect. Ptarmica, 15), in clave.—*Ptarmica alpina* DC. Prodr. VI (1837) 22 p. p. quoad pl. sibiricam.—*P. mongolica* DC. Prodr. VI (1837) 22; Turcz. in Bull. Soc. Nat. Mosc. XXV, 430.—*P. sibirica* Ldb. Fl. Ross. II, 2 (1845) 528; Popov, Fl. Sr. Sib. II, 725.—*Achillea sibirica* Ldb. Ind. Sem. hort. Dorpat. (1811), sec. Ldb. Fl. Ross. II, 2 (1845) 528 in syn.; Kom. and Alis. Opred. Rast. Dal'nevost. Kr. II, 1027; Kitam. Compos. Japon. II, 324.—*A. sibirica* ssp. *mongolica* Heimerl op. cit. (1884) 188 (Monogr. 76).

Perennial. Rhizome short; plants green, covered with rather long, colorless, straight, appressed hairs; stem 30–75 cm high, erect, leafy, branched only in inflorescence or in upper half. Leaves 0.9–9.5 cm long, 1.8–13.0 mm wide, sessile, linear-lanceolate, pinnately lobed or pinnately parted, punctate-glandular hairy or eglandular; lobes linear, acute, unevenly serrate-dentate, pinnately lobed or pinnately parted; secondary lobes and teeth cartilaginous-cuspidate, slightly involute; lower leaves withering before flowering. Inflorescence corymbose; capitula almost ovate, 4.5–6.5 mm long and 3.5–6.0 mm in dia (excluding ligules). Involucre imbricate, 3-seriate; involucre bracts 2.5–4.3 mm long, 1.2–2.0 mm wide, broadly lanceolate, herbaceous in middle, green, with prominent midrib, membranous along margin, yellow, with dark brown border. Receptacular scales like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, 3.3–4.3 mm long, sometimes with or without occasional capitate glandular hairs along tube, ligules white, oval, 1.6–2.7 mm long, 1.5–2.5 mm wide, with 3 weakly developed apical teeth; disk florets white, 5-toothed, tubular, bisexual, 2.0–2.5 mm long, with or without occasional capitate glandular hairs. Achenes broadly oblanceolate, 2.2–2.4 mm long, 1.0–1.2 mm wide. Flowering July to September.

Along riverbanks, in meadows and marshes, in shrub thickets and mixed forests.—*Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: Okhotsk, Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Mongolia, China. Described from Siberia. Type in London.

120 **Note.** *A. alpina* L., originating from Siberia, was not very clearly described in the original description. The type of *A. alpina* L., preserved in London, was accessible with difficulty to the authors dealing with the Siberian flora. Therefore, initially, *A. alpina* L. was wrongly identified with plants later described as *A. ledebouri* Heimerl (cf. the note to this species), and in recent times has been forgotten.

I had at my disposal a photograph of the type of *A. alpina* L. On comparing the photograph of the type specimen of *A. alpina* L. with its description in the catalogue of the London herbarium (S. Savage—*A Catalogue of the Linnaean Herbarium*, 1945, 1956, No. 1017/13), I came to the conclusion that *A. alpina* L. is identical with plants identified as *A. sibirica* Ldb. (*A. mongolica* Fisch. ex Spreng.) in the Soviet Union.

This is evident from the plant height, the shape, incision and size of leaves, and the size and number of capitula in inflorescence.

Therefore, it is no longer necessary to resolve the question about the nomenclatural preference of *A. mongolica* Fisch. ex Spreng. over *A. sibirica* Ldb., nor about the futile attempts of Maximowicz (cf. *Mém. Acad. Sc. St.-Péterb., sav. étr.* 1859, 154) to distinguish *A. mongolica* Fisch. ex Spreng. and *A. sibirica* Ldb. as separate species.

Now one thing is clear: the prior name of the species under consideration is *A. alpina* L.

42. ***A. japonica*** Heimerl in Denkschr. Acad. Wien, XLVIII (1884) 128 (Monogr. sect. *Ptarmica*, 16), in clave non *A. japonica* Sch. Bip. (1854), nom. nudum.—*A. sibirica* Ldb. ssp. *japonica* Heimerl op. cit. 190 (Monogr. 78); Kitam. Compos. Japon. II, 327.—*Ptarmica mongolica* DC. var. *lilacina* Fr. Schmidt in *Mém. Acad. Sc. St.-Pétersb.* VII sér. XII, 2 (1868) 147.

Perennial. Rhizome long; plants green, with long, straight, appressed, colorless hairs; stem 35–115 cm high, erect, leafy, branched in inflorescence or in upper half. Leaves 0.5–12.5 cm long, 1–20 mm wide, sessile, lanceolate, punctate-glandular-hairy, or eglandular, pinnately parted or pinnately cut; lobes or segments linear, acute; unevenly serrate-dentate, pinnately parted or pinnately cut; lobes, segments and teeth cartilaginous-cuspidate, slightly involute; lower leaves withering before flowering. Inflorescence corymbose; capitula semiglobose, 5–7.5 mm long, 5–7 mm in dia (excluding ligules).

Involucre imbricate, 3-seriate; involucre bracts 2.6–4.3 mm long, 1–2 mm wide, broadly lanceolate, herbaceous in middle, green, with prominent midrib, membranous on margin, yellow, with dark brown frill. Receptacular scales like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, glabrous, 4.8–5.0 mm long; ligules white or pink, oval, 3.3–3.5 mm long, 2.7–3.5 mm wide, 121 with 3 obtuse teeth at apex; disk florets white, 5-toothed, tubular, bisexual, 2.3–2.5 mm long, glabrous. Achenes oblanceolate, about 1.7 mm long, 0.6 mm wide. Flowering July to September.

Along riverbanks and sea coasts, in meadows and on herb slopes.—*Far East*: Ussuri, Sakhalin. *General distribution*: Japan, China. Described from Japan. Type in Leningrad.

Note. Several plants from different localities in Japan are cited in the description of *A. sibirica* Ldb. ssp. *japonica* Heimerl (l. c.). I am selecting as the lectotype of *A. japonica* Heimerl the well collected plants with the following label: "*Japonia, Insula Jesso, circa Hakodate, Dr. Albrecht. 1861*," which are preserved in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR.

Sometimes hybrids with *A. ptarmicoides* Maxim. are found.

43. ***A. ptarmicoides*** Maxim. Prim. Fl. amur. (1859) 154; Heimerl in Denkschr. Acad. Wien, XLVIII, 127 (Monogr. sect. *Ptarmica*, 15), in clave; Kom. and Alis. Opred. Rast. Dal'nevost. Kr. II, 1027.—*A. sibirica* Ldb. var. *discoidea* Rgl. in Mém. Acad. Sc. St.-Pétersb. sér. VII, IV, No. 4 (1861) 87; Kitam. Compos. Japon. II, 325.—*A. sibirica* Ldb. ssp. *ptarmicoides* Heimerl op. cit. 189 (Monogr. 77).—*Ptarmica ptarmicoides* Worosch. in Delect. semin. hort. bot. princ. Acad. Sc. URSS, 10 (1955) 21 and in Bot. Mat. Gerb. Bot. Inst. Acad. Nauk SSSR, XIX (1959) 641.

Perennial. Rhizome short; plants green, sparsely covered with rather long, straight, appressed, colorless hairs; stems 20–100 cm high, erect, leafy, branched only in inflorescence. Leaves 0.6–10.0 cm long and 1.5–15.0 mm wide, punctate-glandular hairy, sessile, lanceolate, pinnately cut; segments linear, acute, unevenly serrate-dentate, pinnately cut; teeth and segments cartilaginous-cuspidate, slightly involute; lower leaves withering before flowering. Inflorescence corymbose; capitula usually numerous, 4–6 mm long, 3.0–5.5 mm in dia (excluding ligules), subovoid. Involucre imbricate, 3-seriate; involucre bracts 1.5–4.0 mm long, 1.0–1.8 mm wide, broadly lanceolate, herbaceous in middle, green, with prominent midrib, membranous on margin, yellow or yellow with narrow dark brown border. Receptacular scales, like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, 2.2–3.3 mm long, with capitate glandular hairs along tube; ligules

white, oval, 0.7–1.5 mm long and 0.7–1.6 mm wide, sometimes erect, with 3 rather deeply divided obtuse teeth, sometimes outer (ray) florets 1.8–2.0 mm long, tubular, with rudimentary ligule comprising 3 obtuse teeth; disk florets white, 5-toothed, tubular, bisexual, 2.2–2.3 mm long, covered with capitate glandular hairs. Achenes oblong or oblanceolate, 2.3–2.6 mm long and 1.0–1.3 mm wide. Flowering July to September.

122 Valley and mountain meadows, shrub thickets.—*Eastern Siberia*: Dauria; *Far East*: Zeya-Bureya, Uda River Area, Ussuri, Sakhalin. *General distribution*: Japan, China. Described from Amur. Type in Leningrad.

Note. In describing *A. ptarmicoides* Maxim. (l. c.), the author included under it only those specimens at his disposal that had strongly reduced ligules, not surpassing the disk of the capitulum. Plants that had a well developed ligule but in other respects did not differ from the former were identified as *Ptarmica mongolica* (Fisch.) DC. (l. c.), i.e., they were even put in a different genus. In order to be more persuasive of such a separation of the material, he considers *P. sibirica* Ldb. and *P. mongolica* (Fisch.) DC. (in the note to the latter) as an independent species. However, after examining the authentic specimens of *P. sibirica* Ldb. and *P. mongolica* (Fisch.) DC., one is convinced that they belong to a single species (cf. above my note to *Achillea alpina* L.) and also that this species differs from the material included under it by Maximowicz.

All this discussion indicates that Maximowicz artificially separated the specimens studied by him into *A. ptarmicoides* Maxim. and *Ptarmica mongolica* (Fisch.) DC. on the basis of only a single character—ligule length. If other characters are examined, then one is convinced that this is a single species—*Achillea ptarmicoides* Maxim. in which the length of ligules varies. However, other characters, in particular the punctate-glandular hairs on the leaves, capitate glandular hairs on the florets, nature of the division of the leaves, pubescence, etc., constitute a set of more stable characters.

A. ptarmicoides Maxim. was described from several localities. The following plant was selected as the lectotype: “*Untern Amur, in südlichen Theile, bei Uchssumi, auf Mergelboden. nicht selten, 23 Juli 1855 (fl. pr.), C. Maximowicz.*” preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR.

A. ptarmicoides Maxim. hybridizes with *A. alpina* L.

44. **A. camtschatica** Rupr. ex Heimerl in Denkschr. Acad. Wien, XLVIII (1884) 127 (Monogr. sect. *Ptarmica*, 15), in clave.—*A. sibirica* Ldb. ssp. *camtschatica* Heimerl, op. cit. 189 (Monogr. 77); Kitam. Compos. Japan. II 325.—*Ptarmica kamtschatica* Rupr. ex Kom. Fl.

Kamch. III (1930) 138 and Izbr. Soch. VIII, 437.—*A. sibirica* auct. non Ldb.; Hultén, Fl. Kamtch. IV (1930) 169.

Perennial. Rhizome long; plants green, rather densely covered with straight, appressed, long, colorless hairs; involucre bracts and branches of inflorescence with ferruginous hairs; stems 12–85 cm high, erect, leafy, branched only in inflorescence. Leaves 0.6–11.0 cm long, 2–15 mm wide sessile, lanceolate, punctate-glandular hairy, pinnately lobed, pinnately parted, or pinnately cut; leaf segments and lobes linear, acute, unequally sharply serrate-dentate and pinnately lobed, pinnately parted or pinnately cut, teeth and apices of lobes and segments cartilaginous-
 123 cuspidate, slightly involute; lower leaves withering before flowering. Inflorescence corymbose; capitula semiglobose, 5.5–8.0 mm long, 5.5–7.0 mm in dia (excluding ligules). Involucre imbricate, 3-seriate; involucre bracts 2.5–4.5 mm long, 1.5–1.9 mm wide, broadly lanceolate, herbaceous in middle, green, with prominent midrib, membranous along margin, dark brown. Receptacular scales like involucre bracts, reduced from periphery to center. Outer florets 8, pistillate, ligulate, 4.8–7.0 mm long, with isolated, capitate glandular hairs along tube; ligules white, oval, 3–5 mm long, 3.3–4.1 mm wide, with 3 roundish teeth at apex; disk florets bisexual, white, tubular, 5-toothed, 2.0–2.7 mm long, with isolated capitate glandular hairs. Achenes oblong, about 3.3 mm long and 1 mm wide. Flowering July to September.

In forests along meadow-covered slopes, on sands and gravel beds along riverbanks, in willow stands, near lakes and on dunes near the sea.—*Arctic*: Anadyr; *Eastern Siberia*: Lena-Kolyma; *Far East*: Kamchatka (and Commander Islands), Okhotsk, Zeya-Bureya, Sakhalin (Kuril Islands). *General distribution*: Beringia. Described from the vicinity of Petropavlovsk-Kamchatskii. Type in Leningrad.

Series 6. Anthemoideae (DC.) Botsch.—*Ptarmica* sect. *Anthemoideae* DC. Prodr. VI (1837) 19.—Leaves twice or thrice pinnately cut, pubescence of long, scattered, straight, colorless hairs and occasional punctate-glandular hairs beneath. Stems unicapitulate.

45. *A. schuri* Sch. Bip. in Oest. bot. Wochenbl. VI, No. 38 (1856) 300; Popov, Ocherk. Rast. i Fl. Karpat. 247; Klok. in Vizn. Rosl. URSS, 543.—*Anthemis tenuifolia* Schur in Verhandl. Siebenburg. Vereines II, No. 10 (1851) 171, non *Achillea tenuifolia* Lam. (1783).—*A. caespitosa* Herbich in Flora XL (1857) 509.—*Ptarmica tenuifolia* Schur, Enum. pl. Transsilv. (1866) 327.—*Achillea schuri* Heimerl in Denkschr. Acad. Wien, XLVIII (1884) 125 (Monogr. sect. *Ptarmica*, 13), in clave.—*A. oxyloba* DC. ssp. *schuri* Heimerl op. cit. 137

(Monogr. 25).—*Anthemis alpina* (*alpina-sphalm*) auct. non L. (1759); Baung. Enum. pl. Transsilv. III (1816) 145.—Exs.: Fl. exs. Austro-Hung. No. 982.

124 Perennial. Rhizomes branched; stems usually few, uncapitulate, ascending, simple, leafy, slender, 5–20 cm high, below with scattered and above with dense, rather long, straight, appressed colorless hairs. Lower and middle leaves sessile, broadly lanceolate; twice or thrice parted into lanceolate lobes terminating in cusp, glabrous above, with scattered, appressed, rather long, colorless hairs and punctate-glandular hairs beneath, 0.7–3.5 mm long and 4–15 mm wide; upper cauline leaves like involucre bracts. Capitula solitary, 0.9–1.2 cm long and 1.4–2.3 cm in dia (including ligules). Involucre 3-seriate, imbricate; involucre bracts broadly lanceolate, 3–5 mm long and 1.5–2.5 mm wide, green in middle, herbaceous, with weakly developed midrib, with rather long, appressed, colorless, sparse hairs, broadly membranous on margin, dark brown, glabrous. Receptacular scales like involucre bracts, reduced from periphery to center. Outer florets 9–20, pistillate, ligulate, 5.5–8.5 mm long, with glabrous tube; ligules white, obovate, 4.0–6.3 mm long and 2–5 mm wide, obtuse or with 2–3 roundish teeth at apex; disk florets white, 5-toothed, tubular, bisexual, glabrous, 2.2–2.5 mm long. Achenes oblanceolate, about 2.7 mm long, 1 mm wide. Flowering June to August.

On peaks of the Carpathians among rocks and on stony slopes.—*European part*: Upper Dniester. *General distribution*: Central Europe. Described from several places in Romania. Type in Vienna.

Note. *A. schuri* Sch. Bip. and some species that are similar but absent from our flora were initially put in the genus *Anthemis* L. on the basis of their habit, leaf shape and solitary capitula. However, it was shown that these species, unlike *Anthemis* L., have flat, winged achenes, which justified referring them to the genus *Achillea* L. Here, of course, they form a separate group in section *Ptarmica* (DC.) Koch.

GENUS 1517. *Handelia* Heimerl^{1,2}

Heimerl in Oest. Bot. Zeitschr. LXX (1922) 215.

Capitula small, many-flowered, subglobose, in dense or lax corymbs. Involucre 3-seriate, not imbricate; bracts oblong, obtuse,

¹Treatment by L.I. Tzvetkova.

²Named in honor of the Austrian botanist H. Handel-Mazzetti.

greenish, broadly white membranous on margin, slightly pubescent outside. Receptacle strongly convex, finely alveolate; receptacular scales membranous, oblong. Florets bisexual, yellow, tubular, 5-toothed, turbinate, glandular-hairy. Anthers with acute appendages. Stigma bifid, exserted, with oblong-clavate branches. Achenes small, papillose, turbinate, with 5 indistinct ribs, apically truncate and with truncate, somewhat thick, weakly developed border. Leaves oblong, thrice pinnately cut; basal leaves large, petiolate; cauline leaves sessile, smaller. Perennial or biennial herbs, with dense white-tomentose pubescence in lower part of plant, with tap root. Monocarpic.

A monotypic genus.

- 125 1. **H. trichophylla** (Schrenk) Heimerl in Oest. Bot. Zeitschr. LXX (1922) 215.—*Achillea trichophylla* Schrenk, Enum. plant. nov. I (1841) 48; Ldb. Fl. Ross. II, 2, 538; O. and B. Fedtsch. Perech. Rast. Turk. IV, 182.—Exs.: Gerb. Fl. SSSR, No. 3261.

Perennial or triennial. Tap root, thickened in upper part. Stem one or few, 10–100 cm high, 0.5–2 cm in dia, erect, ribbed, leafy, branched above or only in inflorescence, at base densely white-tomentose-lanate, more or less glabrous above. Leaves oblong, thrice pinnately cut, segments narrow, about 0.3 mm wide, almost filiform; basal leaves petiolate, densely pubescent, 5–30 cm long, 2–12 cm wide; cauline leaves sessile, smaller, less densely pubescent, uppermost leaves subglabrous. Capitula small, 3–5 mm long and in dia, in dense, less often lax corymbs. Involucre 3-seriate, not imbricate; bracts oblong, obtuse, greenish with broad white-membranous margin, 2–3 mm long and 0.5–1.0 mm wide, weakly pubescent. Receptacular scales membranous, glabrous, almost linear. Florets bisexual, yellow, tubular, 5-toothed, turbinate, about 2 mm long, 1 mm wide, glandular hairy. Achenes brownish-yellow, 1.0–1.5 mm long, 0.3–0.6 mm wide. Flowering May to August.

In mountains and foothills, on shallow, stony slopes.—*Soviet Central Asia*: Lake Balkhash Region, Dzhungaria-Tarbagatai, mountainous Turkmenia, Pamiro-Alai, Tien Shan. *General Distribution*: Dzhungaria-Kashgaria. Described from Dzhungarian Alatau. Type in Leningrad.

GENUS 1518. **Santolina** L.^{1,2}

L. Sp. pl. (1753) 842.

Capitula on rather long, erect peduncles, one each at apices of stem and lateral branches, but usually numerous, homogamous, with numerous bisexual tubular florets. Involucre broadly cyathiform, 5–12 mm in dia and 3–6 mm long; involucre bracts coriaceous herbaceous, imbricate in 3–4 irregular rows; outer bracts lanceolate, inner 1.5–2 times as long, oblong or linear-oblong, more or less membranous on margin or not. Receptacle convex, usually almost subglobose, plump, punctate-alveolate, densely squamose; scales rather hard, oblong or linear, more or less carinate outside, obtuse or subacute. Corolla of tubular disk florets yellow, 3–5 mm long, with 5 lanceolate recurved teeth; corolla tube rather long, narrow, somewhat abruptly broadened in upper 1/5–1/3, usually with 1–3 short processes at base, retrorse and appressed to achene apex. Filaments rather long, glabrous; anthers lacking distinct basal appendages, with oblong-lanceolate, subobtusely apical appendage; pollen grains round, covered with spinules. Style bifid; its branches narrow-linear, truncate. Achenes 1.5–2.5 mm long, 0.4–0.8 mm wide, with 3–5 fairly prominent longitudinal veins, prismatic, narrowed toward base, lacking pappus (corona) at apex; outer achenes often larger, with obtuse upper margin of achenes somewhat raised on one side. Glabrous or somewhat hairy perennial herbs and semishrubs with more or less erect or ascending (sometimes prostrate), densely leafy stems and alternate, petiolate leaves with more or less pinnatisect or pinnatilobate, sometimes almost entire lamina.

About 30 species of this genus are distributed in Southern Europe and Northern Africa; some species are ornamental plants and often grow wild.

Type of genus: *Santolina chamaecyparissus* L.

1. Plants grayish-tomentose; leaves 2–6 mm wide, with petiole slightly expanded at base 1. **S. chamaecyparissus** L.
- + Plants glabrous; leaves 0.8–3.0 mm wide, with petiole expanded at base 2. **S. viridis** Willd.

1. **S. chamaecyparissus** L. Sp. pl. (1753) 842; DC. Prodr. VI, 34; Stank. and Tal. Oprod. Vyssh. Rast. Evrop. Chasti SSSR (1949) 623.—

¹Treatment by N.N. Tzvelev.

²From Latin words *sanctus*—sacred, and *linum*—linseed; named for the medicinal importance of the plant and its narrow leaves; may also be based on the ancient name of Santones Region in France, where it is a very common plant.

S. incana Lam. Fl. Fr. II (1778) 43.—**lc.**: Pflanzenfam. IV, 5 (1890) 269; Hegi, Ill. Fl. VI, 2 (1929) 673, f. 381; Jav. and Csap. Ic. Fl. Hung. (1933) 522.

Perennial. Plants 15–100 cm high, strongly aromatic, grayish-tomentose from simple flexuous hairs; stems more or less woody at base, usually strongly branched, erect or ascending, densely leafy. Leaves 1–6 cm long, 2–6 mm wide, grayish from sparse tomentum, on short (1/6–1/4 as long as lamina) petioles; petioles weakly broadened at base; their lamina linear or narrow-linear, pinnately cut with numerous lateral lobes, entire or 2–3-parted from base, linear or oblong, obtuse or subobtuse, often not in same plane, forming pseudo-whorl. Capitula solitary at apices of stem and lateral branches, but numerous on plant, on long slender peduncles. Involucre 5–10 mm in dia, 3.5–5.5 mm long; involucre bracts more or less tomentose outside. Florets tubular; corolla 3–5 mm long, yellow. Achenes 1.5–2.0 mm long, 0.5–0.6 mm wide, with 4, less often 3–5, prominent ribs, lacking pappus. Flowering July to September.

- 127 Cultivated in gardens and parks as an ornamental and aromatic plant, mostly in southern regions, at times found as an introduced or escaped plant. *General distribution*: Western Mediterranean (in the east up to Yugoslavia). Described from Southern Europe. Type in London (Kew).

Economic Importance. Besides its ornamental (mostly as a border plant) importance, in its native country it is widely used as a medicinal plant. It contains an insecticide.

2. *S. viridis* Willd. Sp. pl. III (1803) 1798; Poir. in Lam. Encycl. VI (1804) 504; DC. Prodr. VI, 35.

Perennial. Plants 15–100 cm high, strongly aromatic, wholly glabrous; stem more or less woody near base, usually strongly branched, erect or ascending, densely leafy. Leaves 1.5–6.0 cm long, 0.8–3.0 mm wide, on shorter (1/8–1/4 as long as lamina) petioles; petioles basally broadened; lamina narrow-linear, pinnately parted or pinnately cut; lateral lobes numerous, entire or 2–3-parted from base, obtuse or subacute, oblong-linear to obovate; often arranged not in a same plain, forming pseudowhorl, very short on vegetative branches and usually appressed to leaf axis. Capitula and achenes as in previous species. Flowering June to September.

Cultivated as an ornamental and aromatic plant primarily in the more southern regions; rarely escaped.—*European part*: Crimea (southern part); *Caucasus*: Ciscaucasia. *General distribution*: Western Mediterranean. Described from Southern Europe. Type in Berlin.

Note. This species is often combined with the previous species as a form or variety. However, it differs from the former species not only in the absence of pubescence but also in leaf shape and, in my view, it fully deserves the status of a separate species.

GENUS 1519. *Otanthus* Hoffmgg. and Link ^{1,2}

Hoffmgg. and Link, Fl. Port. II (1809) 36.—*Diotis* Desf. Fl. Alt. II (1798) 260, non Schreb. 1791.—*Neesia* Spreng. Anleit. II, 2 (1818) 547, non *Neesia* Blume, 1835, nom. conserv.

Capitula (1)2–10(12), on short (1–14 mm long) thickened peduncles in rather dense, terminal corymbs, homogamous with numerous bisexual tubular florets. Involucre broadly poculiform, 6–10 mm in dia and 128 4.5–6.0 mm long, involucre bracts coriaceous-herbaceous, more or less lacking membranous border, imbricate in 3–4 irregular rows; outer bracts ovate, inner oblong, 1.5–2 times as long. Receptacle convex, hemispherical, punctate-alveolate, squamose; scales rather stiff, oblong, more or less carinate, usually tomentose above on outside. Florets all tubular; corolla yellow, 3.0–4.5 mm long, with 5 lanceolate-deltoid divergent teeth; corolla tube greatly swollen over larger lower part and flattened dorsally, carinate along sides, covering ovary apex and continued along its sides as 2 long (only slightly shorter than mature achene) auriculate spurs. Filaments rather long, glabrous; anthers lacking distinct basal appendages, but, with oblong-lanceolate subobtus apical appendages; pollen grains round, covered with spinules. Style bifid; branches narrow-linear, truncate. Achenes 2–3 mm long, slightly arcuate, with 5 (less often 4) prominent longitudinal veins, without pappus (corona) but remaining attached to lower swollen part of corky corolla, upper part fragile. Perennial herbs covered with dense whitish tomentum, more or less branched, erect or ascending, densely leafy stems, and alternate sessile leaves with oblong or linear-oblong, almost entire lamina.

A monotypic genus.

Note. The single species of the genus, hardly, however, remaining homogenous over its vast range, shows a definite close relationship with the genus *Santolina* L., owing to its adaptation to the peculiar growth conditions on coastal sands.

¹Treatment by N.N. Tzvelev.

²From the Greek words *ous* (*otos*)—ear, and *anthos*—flower; so named because of the unique structure of the corolla, whose tube is prolonged as two long ear-shaped processes along both sides of the achene.

1. **O. maritimus** (L.) Hoffm. and Link, op. cit. 365.—*Filago maritima* L. Sp. pl. (1753) 927.—*Athanasia maritima* (L.) L. Sp. pl. (1763) 1182.—*Santolina maritima* (L.) Crantz, Inst. I (1766) 287; Willd. Sp. pl. III, 1799.—*S. tomentosa* Lam. Fl. Fr. II (1778) 41, non Pers. 1807.—*Diotis candidissima* Desf. Fl. Alt. II (1798) 261; DC. Prodr. VI, 34.—*D. maritima* (L.) Sm. Engl. Fl. III (1825) 403; Boiss. Fl. or. III, 253; Kolak. Fl. Abkh. IV, 229; Grossh. Opred. Rast. Kavk. 457.—*Neesia maritima* (L.) Spreng. ex Steud. Nom. ed. 2, II (1841) 188.—**lc.**: Rchb. Ic. Fl. Germ. XVI (1854) t. 998; Pflanzenfam. IV, 5, 269; Bonnier, Fl. Compl. France, Suisse et Belg. V, t. 298.

Perennial. Plants 10–30 cm high, usually strongly branched at base, covered with dense whitish tomentum; stem erect or ascending, densely and uniformly leafy. Leaves 7–18 mm long and 2.5–6.0 mm wide, sessile, with slightly broadened base; lamina oblong or linear-oblong, somewhat thick, without distinct veins, subobtusely, obtusely denticulate (teeth usually hidden in dense tomentum). Capitula in rather dense apical corymbs of (1)2–10(12) capitula. Involucre 6–10 mm in dia, 4.5–6.0 mm long, more or less tomentose on outside. Florets all tubular; corolla tubular yellow, strongly swollen in lower part, with 2 long, downward directed auricles, firmly decurrent on sides of ovary (and mature achene); achenes 2–3 mm long, adherent with lower swollen part of corolla, lacking pappus. Flowering July to September.

On coastal sands.—**Caucasus**: Western Transcaucasia (Abkhazia). **General distribution**: Atlantic Europe, Mediterranean, Balkans. Described from Southern Europe. Type in London (Kew).

Note. The locality of this species in Abkhazia is the only place in the Black Sea basin, and apparently the plant was introduced here.

Economic Importance. May be used as an ornamental plant.

Subtribe 2. CHRYSANTHEMINAE O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 273.—Trib. *Senecionideae* Less. subtrib. VI. *Chrysanthemeae* Less. 2. *Chrysanthemeae* Less. Synops. Comp. (1832) 250 and subtrib. VII. *Artemisieae* Less. 2. *Cotuleae* Less. and 4. *Artemisieae* Less. op. cit. 260, 263.—Receptacle glabrous or hairy, but lacking scales.

GENUS 1520. *Argyranthemum* Webb. Ex Sch. Bip.^{1,2}

Sch. Bip. in Webb. and Berth. Phyt. Canar. II (1842) 258.—*Chrysanthemum* sect. *Magarsa* DC. Prodr. VI (1837) 65.—*C.* sect. *argyranthemum* (Webb. ex Sch. Bip.) Benth. and Hook. f. Gen. pl. II (1876) 426, p. p.; Hoffm. in Pflanzenfam. IV, 5, 278 p. p.

Capitula numerous (up to 50 or more), solitary at apices of leafy branches, heterogamous, with 10–25 pistillate, ligulate peripheral florets in one row, and numerous bisexual tubular disk florets. Involucre patelliform, 10–18 mm in dia, and 4–6 mm long; involucre bracts coriaceous-herbaceous, imbricate, in 3–4 irregular rows; outer bracts lanceolate-ovate, subobtusate, with rather wide, light colored, membranous border; inner bracts oblong, 2–2.5 times as long as outer, with large, broadly oval, entire or more or less discontinuously toothed membranous appendages, at apex, decurrent on margins of bracts. Receptacle strongly convex, obtusely conical, plump, glabrous, weakly punctate-tuberculate with scarcely visible alveolation. Corolla of ligulate florets white, with strongly flattened tube but lacking auricles, 1.5–2.5 mm long and linear or oblong-linear limb, 8–15 mm long; corolla of tubular disk florets yellow, 2.5–3.5 mm long, with tube narrowed in lower part, rather abruptly broadened in upper part, with 5 deflexed triangular teeth, 1/6–1/5 as long as tube. Filaments thicker in upper part; anthers lacking distinct basal appendages, but with lanceolate-ovate, subobtusate apical appendages; pollen grains round, spiny. Style bifid; branches linear, truncate. Achenes heterogenous, glabrous, in peripheral florets 3.0–4.5 mm long and 2.5–3.5 mm wide, with three prominent, broad winged ribs (ventral and lateral) and scarcely visible veins inbetween, strongly truncate in upper part, with base of corolla enclosed in shallow depression, in tubular florets 1.8–2.5 mm long and 0.8–1.2 mm wide, more or less flattened laterally, with 5–8 longitudinal ribs, of which one ventral rib (in outer achenes winged) prominent, in others weakly developed, with truncate (longer on ventral side) corona at apex up to 0.4 mm long, usually shallow and obtusely lobed depending on number of ribs. Glabrous or subglabrous (with short simple hairs), strongly branched semishrubs with branches woody to a considerable length and alternate leaves with more or less divided or lobed laminae.

The genus comprises 12–15 species occurring almost exclusively on the Canary Islands; one of them is cultivated as an ornamental plant.

¹Treatment by N.N. Tzvelev.

²From the Greek words *argyros*—silver, and *anthemos*—flower; so named on the basis of the silvery membranous appendages on the inner involucre bracts.

Type of genus: *Argyranthemum frutescens* (L.) Sch. Bip.

Note. It shows a especially close relationship with the genus *Chrysanthemum* L. and in relation to it appears more "ancient," i.e., closer to the ancestor of both genera.

***A. frutescens** (L.) Sch. Bip. op. cit. 264, t. 91.—*Chrysanthemum frutescens* L. Sp. pl. (1753) 877.—*Pyrethrum frutescens* (L.) Willd. Sp. pl. III (1803) 2150; DC. Prodr. VI, 65.—**lc.**: Sch. Bip. l. c.; Hegi, Ill. Fl. VI, 2 (1927) 595.

Perennial. Glabrous or subglabrous semishrub, up to 1 m high; stems strongly branched above base, woody to considerable length, erect. Leaves with inconspicuous punctate-glandular hairs, up to 10–12 cm long, 4–5 cm wide, on rather long, narrow-winged petiole, basally thickened and often with 1–2 very small lateral lobes on each side; lamina ovate to oblong, once or twice pinnately parted up to very narrow-winged axis, with 2–5 distant segments of different size and form on each side; apical lobes linear or lanceolate, 0.6–4.0 mm wide, with rather long cartilaginous cusp; uppermost leaves strongly reduced, partly entire. Capitula numerous, solitary on leafy branches, sometimes
131 in corymbs, on rather long (to 15 cm long) peduncles. Involucre 10–18 mm in dia, 4–5 mm long; inner involucre bracts with large, light-colored (silvery) membranous apical process. Ligulate florets white, with 8–15 mm long limb; tubular florets yellow. Achenes heterogenous; in ligulate florets with 3 winged ribs, in tubular florets with 1 prominent (often winged) and 4–7 weak ribs; corona up to 0.4 mm long, truncate. Flowering June to October.

Cultivated as an ornamental plant (in gardens and flower beds in the south, as a potted plant in the north). Native to Canary Islands. Described from the Canary Islands. Type in London.

Economic Importance. A common ornamental plant. There are many varieties that differ in the size of the capitulum, shape of the leaves, and general morphology. It is distinguished by a particularly long flowering period, according to Kiselev (*Tsvetovodstvo*, ed. II, 1953, p. 702), flowering outdoors almost throughout the summer until late autumn, and indoors often throughout the winter.

GENUS 1521. *Chrysanthemum* L.^{1,2}

L. Sp. pl. (1753) 887 p. p.—*Ismelia* Cass. in Dict. Sc. nat. XLI (1826) 40.—*Glebionis* Cass. ibid. 41.—*Pinardia* auct. non Cass.: Less. Syn. Compos. (1832) 255 p. p.—*Xanthophthalmum* Sch. Bip. Tanacet. (1844) 17.—*Chrysanthemum* sect. *Pinardia* (Cass.) Boiss. Fl. or. III (1875) 336 p. p.; Benth. and Hook, f. Gen. pl. II, 425 p. p.; Hoffm. in Pflanzenfam. IV, 5 (1889) 277 p. p.

Capitula solitary or 2–10 on each stem and its leafy branches, heterogamous, with 10–30 (in cultivated varieties sometimes more than 30) pistillate ligulate peripheral florets in one row, and numerous bisexual tubular disk florets. Involucre patelliform or broadly poculiform, 1.3–3.0 cm in dia, 6–8 mm long; involucre bracts coriaceous-herbaceous, imbricate in 3–5 irregular rows; outer bracts ovate, subobtusate, with narrower membranous border; inner bracts oblong, 1.5–3 times as long as outer, with large, broadly oval, entire or more or less discontinuously toothed apical process membranous and decurrent on margins of involucre bracts. Receptacle strongly convex, almost hemispherical, plump, glabrous, weakly punctate-tuberculate, with inconspicuous alveolation. Corolla of ligulate florets yellow (sometimes white in cultivated varieties), with strongly flattened but wingless or more or less wingless, 2.5–5 mm long tube and oblong or linear 8–25 mm long limb; corolla of tubular florets yellow or red, 3–5 mm long, tube narrowed in lower part and rather abruptly broadened above, with 5 deflexed triangular teeth 1/7–1/5 as long as tube. Filaments in upper part slightly thickened; anthers without distinct basal appendages, with oblong-ovoid, obtuse, or subobtusate apical appendage; pollen grains round, spiny. Style bifid; branches linear, truncate. Achenes heterogenous, glabrous, 2.0–4.5 mm long, 1–4 mm wide, those of ligulate florets with 3 or 2 prominent, winged, longitudinal ribs and somewhat inconspicuous, 2–6 ribs in-between, often slightly truncate at apex, of tubular florets with 6–12 more or less uniform ribs, of which usually 1 ventral rib (often winged) prominent or 1–2 prominent ribs (dorsal and ventral) and rest almost indistinct; pappus absent; secretory canal and mucilaginous cells also. Glabrous or slightly hairy (with sparse simple hairs) annual plants with tap root, erect, usually weakly branched stem and alternate leaves with more or less pinnatisect or lobate lamina.

¹Treatment by N.N. Tzvelev.

²From the Greek words *chrysos*—golden, and *anthemos*—flowers, named for the golden-yellow color of the ligulate florets in many species of this genus.

Four out of five species of this genus, mainly distributed in the countries of the Mediterranean, are widely cultivated in various parts of the world and are often found as introduced or escaped plants.

Type of genus: *Chrysanthemum coronarium* L.

Note. In many botanical publications of the past as well as the present, a whole series of general belonging to the tribe Anthemideae (*Chrysanthemum* L., *Leucanthemum* Mill., *Pyrethrum* Zinn., *Tanacetum* L., *Brachanthemum* DC. and many others) is combined under the generic name "*Chrysanthemum* L." However, with such a broad concept of the genus, the borders between not only the genera *Chrysanthemum* L. sensu lato and *Matricaria* L. (the combined genus is called "*Matricaria* L.") but also the genera *Chrysanthemum* L. sensu lato and *Artemisia* L. are lost. Thus, successive "consolidation" of genera inevitably would lead to combining all genera of the tribe Anthemideae with a glabrous or hairy receptacle into a single genus and also contrasting them to the aggregate genus with scaly receptacles, but this single character separating the genera would appear to be very artificial. Therefore, we believe, the only correct way is to divide the species included in these genera into a number of natural smaller genera; however, this should be done, of course, on the basis not of a single character but the entire set of characters, mainly the characters of the reproductive organs. Greater attention should be paid especially to the anatomical characters of the achene and to the structure of the pollen grains, which have been used to a very limited extent in the present study because of the shortage of time.

- 133 The genus *Chrysanthemum* L. sensu stricto occupies a well delineated position in the tribe Anthemideae, showing a close relationship only with the genus *Argyranthemum* Webb. ex Sch. Bip., and is much more distant from the genus *Dendranthema* (DC.) Des Moul. The three sections into which the genus is divided are very natural and well separated; however, in spite of the significant differences in the achene structure, their close affinity is beyond any doubt. Section *Ismelia* is closest to the genus *Argyranthemum* on the basis of achene structure, and may be considered the most "primitive" in comparison with the two other sections.

Economic Importance. The three species of the genus are cultivated in many countries as ornamental plants, and one (*C. roxburghii*) is cultivated in the countries of Southeast Asia as a vegetable.

1. Achenes of peripheral ligulate florets with 2 prominent, winged, lateral longitudinal ribs; leaves entire, irregularly coarsely toothed to pinnatilobate (Sect. *Xanthophthalmum*) 4. **C. segetum** L.

- + Achenes of peripheral ligulate florets with 3 winged longitudinal ribs (ventral and lateral); leaves once or twice pinnately parted 2.
- 2. Achenes with 2–3 broad winged ribs; intermediate ribs indistinct or almost so; corolla of tubular florets dark red (Sect. *Ismelia*) 1. **C. carinatum** Schousb.
- + Achenes with distinct but less prominent intermediate ribs; corolla of tubular florets variously colored (Sect. *Chrysanthemum*) 3.
- 3. Leaves thrice pinnately parted or divided 2. **C. coronarium** L.
- + Leaves pinnately parted, with irregularly coarsely toothed, less often spatulate lobes 3. **C. roxburghii** Cass.

Section 1. *Ismelia* (Cass.) DC. Prodr. VI (1837) 65.—*Ismelia* Cass.

1. c.—Achenes of peripheral ligulate florets with 3 broad-winged ribs, especially ventral, projecting far above base of floret as acute winged process; intermediate ribs indistinct or only almost so dorsally; achenes of tubular disk florets strongly compressed laterally, with 2 prominent ribs (dorsal and especially ventral); other ribs indistinct or only scarcely visible. Corolla of tubular florets dark red.

Type of section: *Chrysanthemum carinatum* Schousb.

1. **C. carinatum** Schousb. Vextr. Marokko (1800) 198, t. 6; DC. Prodr. VI, 65.—*Ismelia versicolor* Cass. Dict. Sc. Nat. XLI (1826) 41.—**Ic.**: Schousb. 1. c.; Hegi, Ill. Fl. VI, 2, fig. 309d–h.

134 Annual. Glabrous or subglabrous plants, 20–70 cm high, with short tap root; stem erect, simple or more or less branched above. Leaves lacking punctate glandular hairs; basal leaves withering early; middle and lower cauline leaves to 8–10 cm long, on more or less long petioles, but always with small auriculate lobes close to their base; lamina obovate to oblong, 2- (less often 1-) pinnately parted up to very narrow-winged axis, with 3–8 lobes on each side; apical lobes ovate to linear, 1–4 mm wide, cartilaginous-acute. Capitula solitary or 2–10 on leafy lateral branches, usually not in corymbs and blooming at different times; peduncles 10–15 cm long. Involucre 1.5–2.8 cm in dia, 6–8 mm long, glabrous; inner involucre bracts 1.5–2.0 times as long as outer, with large light colored or brownish, scarious apical process widely decurrent on margins of bracts. Corolla of ligulate florets usually 2 or 3-colored, yellow, with whitish or reddish tinge, darker toward base, less often concolorous, yellow, with 2.5–4.0 mm long tube and 15–25 mm long limb; corolla of tubular florets dark red, 3.0–4.5 mm long. Achenes 3.0–4.5 mm long and 2.5–4.0 mm wide. Flowering July to October.

Cultivated as an ornamental plant; in the south found at times as an introduced or escaped plant. *General distribution*: Northwestern Africa. Described from Morocco. Type in Copenhagen.

Economic Importance. A few varieties differing in flower color, capitulum size, and morphology are cultivated. Apparently, it forms hybrids with other species.

Section 2. Chrysanthemum.—*C. sect. Glebionis* (Cass.) DC. Prodr. VI (1837) 64.—*C. sect. Euchrysanthemum* Clarke, Compos. ind. (1876) 146.—*Glebionis* Cass. l. c.—Achenes of peripheral ligulate florets with 3 prominent, narrow-winged ribs (ventral and lateral), with 1–2 much less prominent ribs between each pair; achenes of tubular florets weakly compressed laterally, with 1–2 strong prominent longitudinal ribs (ventral and dorsal) and 5–8 thin ribs. Corolla of tubular florets yellow of various shades.

Type of section: type of genus.

2. *C. coronarium* L. Sp. p. (1753) 890; DC. Prodr. VI, 64; Boiss. Fl. or. III, 336; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2, 458; Schmalh. Fl. II, 68; Kom. and Alis. Opred. Rast. Dal'nevost. Kr. II, 1028.—*Matricaria coronaria* (L.) Desr. in Lam. Encycl. III (1792) 737.—*Pinardia coronaria* (L.) Less. Syn. Compos. (1832) 255.—*Ic.*: Bonnier, Fl. Compl. France, Suisse et Belg. V (1921) t. 295; Hegi, Ill. Fl., VI, 2, fig. 306.

135 Annual. Glabrous or subglabrous plants, 25–70 cm high, with short tap root; stem erect, simple or more or less branched above. Leaves lacking punctate glandular hairs; basal leaves withering early; middle and lower cauline leaves to 8–10 cm long, sessile, oblong or oblong-obovate, twice pinnately parted up to narrow-winged axis, with 4–10 lobes on each side, usually broadest in the upper third, gradually narrowed to narrow-winged base, with more or less developed auricles, apical lobe ovate to linear, cartilaginous-acute; upper leaves smaller and less divided. Capitula solitary or in groups of 2–8 on leafy lateral branches, usually not in corymbs; peduncles to 15–20 cm long. Involucre 1.5–3.0 cm in dia, 6–8 mm long, glabrous or subglabrous; inner involucre bracts 2–3 times as long as outer, with large light colored or brownish, scarious, apical appendage decurrent on margins of bracts. Corolla of ligulate florets yellow of various shades, sometimes (under cultivation) white, with 3–5 mm-long tube and 15–25 mm-long limb; corolla of tubular florets yellow, 3.5–5.0 mm long. Achenes 2.8–4.0 mm long, 2.0–3.5 mm wide. Flowering July to October.

Cultivated as an ornamental plant; at times found as introduced or escaped plant. *General distribution*: Mediterranean. Described on the

basis of garden specimens originating from the Island of Crete (or Sicily). Type in London.

Economic Importance. There are a large number of varieties of this species known in cultivation since the 16th century. They differ mainly in flower color, capitulum size, shape of leaves, and time of flowering. There are "double" varieties with tubular florets entirely or partly modified into ligulate florets.

3. **C. roxburghii** Cass. in Dict. Sc. Nat. XLI (1826) 41; Desf. Cat. Hort. Par. ed. III (1829) 170; DC. Prodr. VI, 64; Kom. and Alis. Oprod. Rast. Dal'nevost. Kr. II, 1028.—*C. coronarium* auct. non L.: Kom. in Tr. Peterb. Bot. Sada, XXV (1907) 644.—*Matricaria oleracea* Buch.—Ham. in Wal. Catal. pl. East Ind. Mus. (1828) 111, nom. nud.—*Pinardia roxburghii* (Cass.) Less. in Ind. III Sem. Hort. Petrop. (1836) 20.—*Glebionis roxburghii* Cass. ex DC. l. c. in syn.

Annual. Glabrous or subglabrous plants, 20–60 cm high, with short tap root; stem erect, simple or more or less branched above, usually thicker and succulent than previous species. Leaves lacking punctate glandular hairs; middle and lower cauline leaves 8–10 cm long, sessile, usually with broad amplexicaul base, oblong, pinnatipartite up to broadly winged axis; lobes of first order oblong to linear-oblong, usually irregularly coarsely toothed, cartilaginous-subacute; upper leaves 136 smaller, often with entire lobes. Capitula solitary or 2–10 on each leafy lateral branch, usually not in corymbs; peduncles to 15–20 cm long. Involucre 1.4–2.2 cm in dia, 6–7 mm long, glabrous or subglabrous; inner involucre bracts 2–3 times as long as outer, with large, scarious apical appendage broadly decurrent on bract margins. Corolla of ligulate florets yellow, with 3–5 mm long tube and 8–20 mm long limb; corolla of tubular florets yellow, 3.0–4.8 mm long. Achenes 3–4 mm long, 1.8–2.5 mm wide. Flowering July to September.

On waste ground, by roadsides, as an introduced weed (or escaped) plant; at times cultivated as an ornamental or vegetable.—*Far East*: Ussuri. *General distribution*: Southeast Asia; often introduced in other countries. Described from garden-grown specimens originating from India and China. Type in Paris.

Economic Importance. Cultivated as a vegetable in the countries of Southeast Asia (especially in China and India); the young stems before flowering are edible. There are varieties with strongly reduced ligulate florets (var. *breviradiatum* DC. op. cit. 64) and totally lacking ligulate florets (var. *discoideum* DC. op. cit. 64), which have not been noted so far in the flora of the USSR. Since ancient times, they have been propagated in many botanical gardens; therefore, this species can be found, together with other annual chrysanthemums, as an ornamental

or introduced weedy plant in other regions of the Soviet Union. Its origin is not entirely clear; apparently, the species originated as a result of the long-term cultivation of *C. coronarium* (with which it is often combined) in the more humid and warm climate of Southeast Asia.

Section 3. *Xanthophthalmum* (Sch. Bip.) Tzvel. comb. nova.—*Xanthophthalmum* Sch. Bip. l. c.—Achenes of peripheral ligulate florets with 2 prominent, narrow-winged, lateral ribs and 3–6 approximate, inconspicuous ribs on each side in between; achenes of tubular florets almost cylindrical, with (9)10(12) almost similar, more or less uniformly disposed, longitudinal ribs. Corolla of tubular florets yellow.

A monotypic section.

4. ***C. segetum*** L. Sp. pl. (1753) 889; DC. Prodr. VI, 64; Ldb. Fl. Ross. II, 559; Boiss. Fl. or. III, 336; Schmalh. Fl. II, 67; Klok. in Vizn. Rosl. USSR, 537.—*C. laciniatum* Gilib. Fl. lithuan. (1781) 218.—*Matricaria segetum* (L.) Schrank, Baier, Fl. II (1789) 406; Desr. in Lam. Encycl. meth. III, 735.—*Pyrethrum segetum* (L.) Moench, Meth. (1794) 597.—*Leucanthemum segetum* (L.) Stank. in Stank. and Tal. Opred. Vyssh. Rast. Evr. Chasti SSSR (1949) 630.—**lc.**: Rchb. Ic. Fl. Germ. XVI (1853) t. 986; Fedtsch. in Fler. Fl. Evrop. Ross. 974, Fig. 973; Bonnier, Fl. Compl. France, Suisse et Belg. V, t. 295; Hegi, Ill. Fl. VI, 2, fig. 315.

137 Annual. Glabrous or subglabrous plant, 20–60 cm high, with short tap root; stem simple, less often somewhat branched, erect. Leaves lacking punctate-glandular hairs; middle and lower cauline leaves 8–10 cm long; lowermost leaves, petiolately narrowed at base, sessile, amplexicaul, oblong, usually entire, irregularly coarse-toothed, less often shallow-pinnatilobate; upper leaves smaller. Capitula solitary or 2–10 on each leafy lateral branch, usually not in corymbs; peduncles to 10–15 cm long. Involucre 1.3–2.0 cm in dia, 5.5–7.5 mm long, glabrous, inner involucre bracts 2–2.5 times as long as outer, with large, scarious, apical appendage broadly decurrent on bract margins. Corolla of ligulate florets golden-yellow, with 3–4 mm long tube and 8–15 mm long limb; corolla of tubular florets yellow, 3.0–4.5 mm long. Achenes 2.0–2.5 mm long, 1.0–1.5 mm wide. Flowering July to September.

On waste ground, by roadsides, in cultivated fields, as an introduced or escaped plant; often cultivated as an ornamental plant.—**European part**: Baltic Region, Ladoga-Ilmen, Lithuania, Upper Dnieper, Middle Dnieper, Volga-Don, Bessarabia, Black Sea Region, Lower Don; **Caucasus**: Reported from Transcaucasia. **General distribution**: Europe (except Arctic Region), Turkey, Northern Africa; often introduced in other countries. Described from Northern Europe. Type in London.

Economic Importance. Often cultivated as an ornamental plant in many varieties, differing mostly in the color of the ligulate florets and the size of the capitula.

GENUS 1522. **Leucanthemella** Tzvel. Nom. Nov.^{1,2}

Decaneurum. Sch. Bip. in Walp. Repert. II (1843) 918 and Tanacet. (1844) 44, non DC. 1833.

Capitula solitary or 2–8 on apices stem and its leafy lateral branches, heterogamous, with 10–30 pistillate, sometimes sterile (as a result of partial reduction of pistil), 1-seriate peripheral ligulate florets, and numerous bisexual tubular disk florets. Involucre patelliform, 10–20 mm in dia, about 4–5 mm long; involucre bracts herbaceous, imbricate, in 2–3 irregular rows; outer bracts lanceolate or broad-linear, subobtuse, with narrower, brownish, scarious border; inner bracts linear or lanceolate-linear, obtuse, usually not more than 1.5 times, less often almost 2 times as long as outer, with rather wide, brownish, sometimes dark-brown, scarious border, enlarged at apex as more or less lacerate-toothed appendage along margin. Receptacle somewhat strongly convex (to almost hemispherical), plump, glabrous, very weakly punctate-tuberculate, with distinct alveolation. Corolla of ligulate florets white, with strongly flattened but wingless or narrow-winged, tube 1.3–2.0 mm long, and elongate or oblong-linear, limb 10–25 mm long, corolla of tubular disk florets yellow, 2–3 mm long, with tube narrower in lower half, rather strongly and abruptly broadened in upper half, with 5 weakly curved deltoid teeth, a fifth to a fourth as long as tube. Filaments slightly thicker in upper part; anthers with scarcely visible basal appendage and oblong-ovoid or ovoid, obtuse apical appendage; pollen grains spherical, spiny. Style 2-parted; branches linear, truncate. All achenes similar (but not developing in ligulate ray florets), glabrous, 2–3 mm long and about 0.8 mm wide, almost cylindrical, narrowed toward base, with (8)10(12) prominent, almost evenly disposed longitudinal ribs, extended at apex of achenes as subobtuse, thickened, up to 0.3 mm long, teeth appearing like corona; mucilaginous cells and secretory canals absent in seed coat. Perennial herbs with long branched rhizome, lacking short nonflowering vegetative branches, with erect, usually weakly branched stem and alternate, entire or 3–5 parted, sessile leaves.

¹Treatment by N.N. Tzvelev.

²Diminutive of *Leucanthemum* Mill.

The two species of this genus sporadically distributed in the countries of Southeastern Europe and East Asia, are also found in the USSR.

Type of genus: *Leucanthemella serotina* (L.) Tzvel.

Note. The species of this genus are similar to those of the genus *Leucanthemum* Mill. in the external morphology of the achenes and the habit of the plant, however, they are entirely different in the anatomical structure of the achenes, which is very similar to that in *Pyrethrum* Zinn. species. Occupying in a sense an intermediate position between these two genera, *Leucanthemella* species have sterile ligulate florets not typical of *Pyrethrum* and *Leucanthemum*. Considering also the unusual ecology (*Leucanthemella* species are marsh plants) and some habit peculiarities of these species, I prefer following C.H. Schultz (Bipontinus, l. c.) and include them in a separate genus to which I give a new name. The isolated range of the species of this genus and the extremely sporadic distribution of each within its own range also point to the isolation and relictual nature of this genus.

1. Leaves entire, oblong-lanceolate, coarsely toothed 1. **L. serotina** (L.) Tzvel.
- + Leaves linear, entire or 3-5-parted, with narrow-linear entire lobes 2. **L. linearis** (Matsum.) Tzvel.

- 139 1. **L. serotina** (L.) Tzvel. comb. nova.—*Chrysanthemum serotinum* L. Sp. pl. (1735) 888; Schmalh. Fl. II, 68.—*C. uliginosum* (W. and K.) Pers. Syn. pl. II (1807) 480.—*Matricaria serotina* (L.) Desr. in Lam. Encycl. III (1792) 730.—*Pyrethrum serotinum* (L.) Willd. Sp. pl. III (1803) 2151; DC. Prodr. VI, 57.—*P. uliginosum* W. and K. in Willd. op. cit. 2152; DC. op. cit. 57; Klok. in Vizn. Rosl. URSR, 539.—*Tanacetum serotinum* (L.) Sch. Bip. Tanacet. (1844) 35, nom. altern.—*Decaneurum serotinum* (L.) Sch. Bip. ibid. 45.—*Leucanthemum serotinum* (L.) Stank. in Stank. and Tal. Opred. Vyssh. Rast. Evrop. Ch. SSSR (1949) 630.—**lc.**: Rchb. Ic. Fl. Germ. XVI (1853) t. 992; Hegi, Ill. Fl. VI, 2, f. 309 i, k; Jav. and Csap. Ic. Fl. Hung. 522.—**Exs.**: Fl. exs. Austro-Hung. No. 2672; Fl. exs. reip. Bohem. et Slov. No. 751; GRF No. 1367.

Perennial. Plants 30-150 cm high, with long, strongly branched rhizome, more or less covered with short bifid and simple hairs, usually almost glabrous; stems from base usually rather numerous, less often solitary, erect, sparsely covered with short curly hairs, densely leafy, simple or with few (1-8) upward directed branches above middle. Leaves on both sides covered with punctate glandular hairs and short curly hairs (to subglabrous), green; basal and lower cauline leaves

withering before flowering; middle cauline leaves sessile, oblong-lanceolate, to 10 cm long, cuneately narrowed toward base and here with 1–2 pairs of linear lateral lobules (auricles), acuminate, coarsely serrate-dentate, with acute long teeth; uppermost leaves strongly reduced, often entire. Capitula solitary or 2–8 at apex of each leafy lateral branch, usually not in corymbs; peduncles long, with very short curly hairs; involucre 10–20 mm in dia and 4–5 mm long, glabrous or subglabrous; inner involucre bracts usually not more than 1.5 times, less often almost 2 times as long as outer, with rather wide brownish membranous border. Corolla of ligulate florets white, with 1.5–2.0 mm-long tube and 15–25 mm-long limb; corolla of tubular florets yellow, 2–3 mm long. Achenes 2–3 mm long, about 0.8 mm wide, with (8)10(12) subobtusate, up to 0.3 mm-long teeth at apex; ovary of ligulate florets lacking distinct teeth. Flowering August to September.

Marshes, marshy meadows.—*European part*: Middle Dnieper (Uzh River valley in Zhitomir Region). *General distribution*: Central Europe (Poland, Czechoslovakia, Hungary, Romania). Described from garden-grown specimens originating from Southeastern Europe (Linnaeus wrongly reported North America as its native country). Type in London.

Economic Importance. Sometimes cultivated as an ornamental plant.

140 2. **L. linearis** (Matsum.) Tzvel. comb. nova.—*Chrysanthemum lineare* Matsumura in Bot. Mag. Tokyo, XIII (1899) 83, t. VI; Kom. in Tr. Peterb. Bot. Sada XXV, 1 (1907) 643.—*C. lineare* var. *manshuricum* Kom. ibid. 822, t. X; Kom. and Alis. Oprod. Rast. Dal'nevost. Kr. II, 1028.—*Ic.*: Matsum. op. cit.; Kom. op. cit.

Perennial. Plants 25–90 cm high, with long, strongly branched rhizome, more or less sparsely pubescent with bifurcate and simple hairs; stems many, less often solitary, erect, sparsely pubescent to subglabrous, densely leafy, simple or branched above. Leaves green above, lacking punctate glandular hairs and more or less glabrous, but strongly scabrous from spinulose tubercles on both sides and along margin, dull green beneath, sparsely pubescent, and also with numerous fine punctate glandular hairs; basal and lower cauline leaves withering before flowering; middle cauline leaves to 8–10 cm long, sessile, usually with 1 pair of very small linear lobes at base, entire, toothless, narrow-linear (to 3 mm, less often 5 mm wide) or 2–5 parted to narrow-winged rachis, with few, entire, narrow-linear lobes; uppermost leaves reduced, usually entire. Capitula solitary or 2–8 at apices of leafy lateral branches, usually not in corymbs; peduncles rather long, covered with very short appressed hairs. Involucre 10–15 mm in dia, 4–5 mm long, sparsely pubescent to almost glabrous; inner involucre bracts 1.5 times, less often 2 times, as long as outer, with brownish or dark

brown membranous border. Corolla of ligulate florets white, with about 1.5 mm-long tube and 10–20 mm-long limb; corolla of tubular florets yellow, 2.4–3.0 mm long. Achenes 2.4–3.0 mm long and about 0.8 mm across, apically with 8–12 subobtusate, to 0.3 mm long teeth. Flowering August to September.

Marshes, marshy meadows.—*Far East*: Ussuri. *General distribution*: China (Manchuria), Korea, Japan (northern part). Described from Japan. Type in Tokyo.

Note. Our specimens possibly differ from typical Japanese specimens, forming a special geographic race (“var. *manshurica* Kom.”); however, in the absence of material for comparison from Japan, it would be premature to consider it as a separate species.

GENUS 1523. *Leucanthemum* Mill.^{1,2}

Mill. Gard. Dict. ed. IV (1754); DC. Prodr. VI, 45 p. p.—*Chrysanthemum* sect. *Leucanthemum* (Mill.) B. Fedtsch. Rast. Turk. (1915) 737.—C. sect. *Pyrethrum* sub-sect. *Leucanthemum* (Mill.) Kitam. in Acta Phyt. et Geobot. IV (1935) 37 p. p.

Capitula solitary, less often 2–5 at apices of stem and its leafy
141 branches, heterogamous, with 12–40 pistillate, ligulate, 1-seriate (sometimes many-rowed under cultivation) peripheral florets and large number of bisexual tubular disk florets. Involucre patelliform 10–22 mm in dia, 3–5 mm long; involucre bracts herbaceous, imbricate, in 3–4 irregular rows; outer bracts lanceolate, subobtusate, with narrow membranous border, inner linear or lanceolate-linear, obtuse, 1.5–2 times as long as outer; with more or less appendicularly broadened membranous border at apex. Receptacle slightly convex, plump, lacking scales, weakly punctate-tuberculate, with distinct alveolation. Corolla of ligulate florets white, with strongly flattened, winged, 1–3 mm-long tube and linear or oblong, 12–25 mm-long limb; corolla of disk florets tubular, yellow, 2–3 mm long, with tube narrower and dorsally flattened in lower half, more or less strongly and abruptly broadened in upper part with 5-deltoid, weakly curved teeth, 1/5–1/4 as long as tube. Filaments thicker in upper part, anthers lacking basal appendage, but with lanceolate-ovoid subobtusate apical appendage; pollen grains spherical, spiny. Style bifid; branches linear, truncate. Achenes heterogenous, glabrous, 1.8–3.2 mm long and about 0.7–0.8 mm wide,

¹Treatment by N.N. Tzvelev.

²From the Greek words: *leukos*—white, and *anthemos*—flower; so named because of the white color of the ligulate florets.

almost terete, narrowed toward base, with (8)10(12) prominent and almost evenly disposed longitudinal ribs, much lighter in color than rest of achene; achenes of ligulate florets distinctly flattened dorsally, more strongly curved, with ribs more approximate ventrally, lacking apical corona or frequently with unilateral, to 0.8 mm long, more or less irregularly toothed corona on edge; achenes of tubular florets lacking apical corona or corona of up to 0.3 mm long subobtuse teeth being continuations of ribs; testa with regular rows of large mucilaginous cells dorsally on ribs, and with longitudinal secretory canals between ribs. Perennial herbs with more or less long rhizome, reduced vegetative branches, erect, simple, less often weakly branched stems and alternate leaves with entire, less often pinnately lobed lamina.

About 20 species of the genus are distributed mainly in the mountainous regions of Southern and Central Europe; only one of these species has a wider range, including all of Europe and the northern part of the Asian continent (except the extreme north); three species are found in the USSR.

Type of genus: *Leucanthemum vulgare* Lam.

Note. The genus occupies a quite isolated position, well separated from other genera of the tribe Anthemideae, including the closest genera *Pyrethrum* Zinn. and *Leucanthemella* Tzvel., in the unusual anatomical structure of the achenes, which was first noted by J. Briquet and F. Cavillier (in E. Burnat, *Flora des Alpes Maritimes*, VI, 1, 1916, p. 80).

142 **Economic Importance.** Some species of the genus are ornamental plants.

1. Lamina of basal leaves more or less rotund; achenes of ligulate florets with well developed, irregularly toothed, 0.5–0.8 mm long corona along margin. Carpathians 1. **L. rotundifolium** (W. and K.) DC.
- + Lamina of basal leaves oblong or oval; achenes of ligulate florets lacking corona or with unilateral corona up to 0.4 mm long ... 2.
2. Involucral bracts with blackish-brown membranous border; basal leaves with broadly oval lamina. Carpathians 3. **L. subalpinum** (Simonk.) Tzvel.
- + Involucral bracts with light-colored or brownish membranous border; basal leaves usually with oblong or oval lamina 2. **L. vulgare** Lam.

Series 1. Rotundifolia Tzvel.—Achenes of ligulate florets with well developed. 0.5–0.8 mm-long corona, irregularly toothed on margin; achenes of tubular florets with corona of up to 0.3 mm-long subobtuse teeth.

1. **L. rotundifolium** (W. and K.) DC. Prodr. VI (1837) 46; Klok. in Vozn. Rosl. URSR, 538.—*Chrysanthemum rotundifolium* W. and K. in Willd. Sp. pl. III (1803) 2144 and Ic. pl. rar. hung. III (1812) 262, t. 236.—*Tanacetum waldsteinii* Sch. Bip. Tanacet. (1844) 35, nom. nov.—*Pyrethrum rotundifolium* W. and K. ex M. Pop. Ocherk Rast. i. Fl. Karpat (1949) 248.—**Ic.:** W. and K. op. cit.; Rchb. Ic. Fl. Germ. XVI (1853) t. 989; Jav. and Csap. Ic. Fl. Hung. (1933) 523 and (1934) t. 38.—**Exs.:** Herb. norm. n. s. No. 1585; Fl. exs. Austro-Hung. No. 3787; Fl. exs. reip. Bohem. et Slov. Nos. 81, 949; Fl. Cechoslov. exs. No. 92; Fl. Polon. exs. No. 743; Pl. Polon. exs. No. 172.

Perennial. Plants 20–70 cm high, with rather long branched rhizome, glabrous or subglabrous (with sparse, very short simple hairs); stems solitary or few, erect, densely leafy, simple, less often with few lateral branches. Leaves lacking punctate glandular hairs; basal leaves 8–10 cm long, petiolate, petioles almost as long as lamina and broadened at base, lamina rotund or broadly obovate, uniformly crenate or toothed; cauline leaves cuneately narrowed in short petiole or sessile, lacking auricles, oblong or oval, uniformly serrate-dentate (sometimes biserrate-bidentate), and with acute teeth at apex; uppermost leaves reduced, sometimes entire. Capitula solitary, less often 2–5; peduncles rather long. Involucre 13–20 mm in dia, 3–4 mm long, glabrous or
143 subglabrous; involucre bracts with blackish-brown membranous border, very narrow in outer bracts, broader in inner, appendicularly broadened at apex. Corolla of ligulate florets white, with 1.0–1.8 mm-long tube and 12–25 mm-long limb; corolla of tubular florets yellow, 2.2–3.0 mm long. Achenes excluding corona 1.8–2.8 mm long, about 0.9 mm wide; corona in achenes of ligulate florets 0.5–0.8 mm long, to 0.3 mm long in tubular florets. Flowering June to August.

Meadows, scrubs, forest glades; in middle and upper mountain zones.—*European part:* Upper Dniester (Carpathians). *General distribution:* Central Europe (Carpathians). Described from the Carpathians. Type in Vienna or Budapest.

Series 2. Vulgaria Tzvel.—Achenes lacking corona, or only ligulate florets with up to 0.4 mm-long unilateral corona.

2. **L. vulgare** Lam. Fl. Franc. II (1778) 137; DC. Prodr. VI, 46; Ldb. Fl. Ross. II, 542; Boiss. Fl. or. III, 335; O. and B. Fedtsch. Perech. Rast. Turk. IV, 183; Kom. and Alis. Oprod. Rast. Dal'nevost. Kr. II, 1031; Grossh. Fl. Kavk. IV, 129 and Oprod. Rast. Kavk. (1949) 459; Kryl. Fl. Zap. Sib. XI, 2739.—*L. ircutianum* DC. Prodr. VI (1837) 47; Ldb. Fl. Ross. II, 543; Turcz. Fl. baic.-dahur. II 43.—*L. leucanthemum* (L.) Rydb. in N. Am. Fl. XXXIV (1916) 235.—*L.*

georgicum D. Sosn. in Zap. Nauchno-Prikl. Otd. Tifl. Bot. Sada, VI (1929) 14 (description in Georgian).—*L. vulgare* var. *ircutianum* (DC.) Kryl. Fl. Zap. Sib. XI (1949) 2739.—*Chrysanthemum leucanthemum* L. Sp. pl. (1753) 888; Schmalh. Fl. II, 68.—*C. dentatum* Gilib. Fl. lithuan. III (1781) 219.—*C. ircutianum* Turcz. in Bull. Soc. Nat. Mosc. XI (1838) 94, nom. nud.—*C. leucanthemum* var. *ircutianum* (DC.) Kryl. Fl. Alt. (1904) 618.—*C. leucanthemum* ssp. *ircutianum* (DC.) Sukacz. in Izv. Ross. Akad. Nauk (1918) 965.—*C. vulgare* (Lam.) Parsa, Fl. Iran. III (1949) 264, non Bernh. 1800.—*Matricaria leucanthemum* (L.) Desr. in Lam. Encycl. meth. III (1792) 731.—*Tanacetum leucanthemum* (L.) Sch. Bip. Tanacet. (1844) 35.—*Pyrethrum leucanthemum* (L.) Franch. Fl. Cher. et Loir. (1885) 307.— **Ic.:** Rchb. Ic. Fl. Germ. XVI (1853) t. 988; Majeovski, Fl. Ed. 3, Fig. 83; Syreistsch. Ill. Fl. Mosk. Gub. III, 266; Fedtsch. and Fler. Fl. Evrop. Ross. Fig. 974; Monteverde, Bot. Atl. Tabl. 36; Hegi Ill, Fl. VI, 2, t. 265, fig. 1 and fig. 325; Zemlinskii, Lekarstv. Rast. SSSR, Ed. 2, 426; Mikhail. in Fl. Beloruss. V (1959) Plate 31.— **Exs.:** Fl. Gall. et Germ. exs. No. 1236; Fl. Ital. exs. No. 978; Fl. Stir. exs. No. 147; Fl. Pol. exs. No. 181; Pl. Pol. exs. No. 170; Pl. Lit. exs. No. 19; Pl. Finl. exs. No. 389; Pl. Bulg. exs. No. 95; GRF No. 271.

Perennial. Plant 15–80 cm high, with inclined or horizontal, often reduced rhizome, glabrous or more or less hairy, hairs simple, very short or longer, curly; stems solitary or few, erect, densely leafy, simple, less often sparingly branched. Leaves lacking punctate glandular hairs; basal leaves 10–15 cm long, long (often exceeding lamina) petiolate, with linear or oval cuneately narrowed lamina, usually obtusely toothed or crenate, less often shallow-lobed; lower cauline leaves short petiolate, others sessile, cuneately narrowed toward more or less broadened (often auriculate) base, oblong or linear-oblong, obtuse or subacute, more or less toothed, with subobtuse or acute teeth, sometimes more or less pinnatilobate at base; uppermost leaves reduced, sometimes entire. Capitula solitary, less often 2–5, on rather long peduncles. Involucre 13–22 mm in dia, 3.5–5.0 mm long, glabrous or subglabrous; involucre bracts with light colored or brownish membranous border, appendicularly broadened at apex of inner bracts. Corolla of ligulate florets white, with 2–3 mm-long tube and 10–25 mm-long limb; corolla of tubular florets yellow, 2–3 mm long. Achenes 1.8–3.2 mm long and about 0.8 mm wide, lacking corona, or ligulate florets with somewhat reduced, to 0.4 mm long, unilateral corona. Flowering May to August.

Meadows, scrubs, forest glades, sometimes as weed in fields and kitchen gardens; to upper mountain zone.—*European part:* All regions, except extreme north; *Caucasus:* All regions except Talysh;

Western Siberia: All regions except north; *Eastern Siberia*: Yenisei (southern part), Angara-Sayans, Dauria (western part), Lena-Kolyma (as an introduced plant); *Far East*: Ussuri and Kuril Islands (as an introduced plant); *Soviet Central Asia*: Aralo-Caspian and Lake Balkhash regions (northern part, rare). *General distribution*: Western Europe, Mongolia, China (northwestern part); as an introduced or escaped plant also in North America, Japan, New Zealand. Described from Europe. Type in London.

Note. Despite its wide range this species is, apparently, replaced only in the mountainous regions of Central and Southern Europe by closely related ecogeographic races. Specimens with a more or less developed corona on the achenes of the ligulate florets are found equally often throughout its range and, in my opinion, have no taxonomic importance, although they were described as a separate species (*L. irtutianum* DC. l. c.) and a variety (*Chrysanthemum leucanthemum* var. *auriculatum* Peterm. *Deutschl. Fl.* 1849, p. 302). Almost throughout its range but usually on drier places, specimens with considerably more dense and stiff pubescence throughout (*Chrysanthemum leucanthemum* var. *hispidum* Boenn. *Prodr. fl. Mon.* 1824, p. 257) and specimens with more or less pinnatilobate cauline leaves near the base are found, which more than once have been described as new species, varieties and forms, but also hardly have any taxonomic significance. Specimens with capitula lacking ligulate florets have been reported from Western Europe (*Chrysanthemum leucanthemum* var. *discoideum* Koch, *Syn. ed.* 2, 1844, p. 416); so far, these have not been found in the Soviet Union.

- 145 **Economic Importance.** Cultivated as a frost-resistant ornamental plant. A "double" form with tubular florets entirely or partially modified into ligulate florets is also found. According to S.E. Zemlinsky (op. cit., pp. 426–427), it has long been used in folk medicine.

Another close ecogeographic race from the Pyrenees is often cultivated as an ornamental plant.—*L. maximum* (Ramond) DC. *Prodr.* VI, 46.—*Chrysanthemum maximum* Ramond. in *Bull. Soc. Philom.* II (1800) 140. It is distinguished by the larger size of the plant, leaves and capitula, serrate-dentate leaves with acute teeth, sometimes becoming lobed, and a slightly broader, lighter colored, membranous border on the involucre bracts.

3. *L. subalpinum* (Simonk.) Tzvel. comb. nova.—*L. raciborskii* M. Pop. and Chrsh. in M. Popov, *Ocherk Rast. i Fl. Karpat* (1949) 248; Klok. in *Vizn. Rosl. URSR*, 539.—*Chrysanthemum leucanthemum* var. *subalpina* Schur in *Verh. und Mitth. Siebenb. Ver.* X (1859) 137.—*Tanacetum subalpinum* (Schur) Simonkai, *Enum. Fl. Transsilv.* (1886) 313.—**lc.**: M. Pop. and Chrsh. op. cit. 249.—**Exs.**: *Fl. Pol. exs.* No. 171 (sub *L. vulgare* ssp. *triviale* var. *alpicola* Gremli).

Perennial. Plants 10–30 cm high, with inclined or horizontal rhizome, glabrous or weakly pubescent; stems solitary or numerous, erect, simple, less often with 1–2 branches. Leaves lacking punctate glandular hairs; basal leaves up to 5–6 cm long, long-petiolate, with oval or broadly oval, cuneately narrowed lamina, obtusely toothed or crenate; middle cauline leaves sessile, cuneately narrowed toward more or less broadened base, oblong or linear-oblong, more or less toothed. Capitula solitary, less often 2–3 on a single stem. Involucre 10–18 mm in dia, 3.5–4.5 mm long, usually glabrous; involucre bracts with blackish-brown membranous border, broader in inner bracts. Corolla of ligulate florets white, with 1.5–2.5 mm long tube and 8–14 mm long limb; corolla of tubular florets yellow, 1.7–2.5 mm long. Achenes 1.5–2.0 mm long and about 0.6–0.7 mm wide, always without corona. Flowering June to July.

Stony slopes, grassy areas; in upper mountain zone.—*European part*: Upper Dniester (Carpathians). *General distribution*: Central Europe (Carpathians). Described from Eastern Carpathians. Type in Sibiu (Romania, former Hermanstadt).

Note. Morphologically, a very weakly separated, alpine, Carpathian race, related to *L. vulgare* through plants with intermediate characters. One must also mention the great similarity of some specimens of *L. vulgare* from the north of the European Part of the USSR with this species.

146 GENUS 1524. *Coleostephus* Cass.^{1,2}

Cass. in Dict. Sc. Nat. XLI (1826) 43.—*Myconia* Neek. ex Sch. Bip. in Webb. and Berth. Phyt. Canar. II (1842) 245, non Lapeyr. 1813, nec *Miconia* Ruiz and Pav. 1794, nom. conserv.—*Chrysanthemum* sect. *coleostephus* (Cass.) Boiss. Fl. or. III (1875) 335; Benth. and Hook. f. Gen. pl. II, 425 p. p.; Hoffm. in Pflanzenfam IV, 5, 278.

Capitula solitary of 2–15 at each apex of main stem and its leafy branches, heterogamous, with 15–40 pistillate but always sterile (as a result of partial reduction of pistil), peripheral ligulate florets in one row, and large number of bisexual tubular disk florets. Involucre patelliform, 8–20 mm in dia, 4–6 mm long; involucre bracts herbaceous, imbricate, in 2, less often more or less 3, irregular rows; linear or oblong-linear, sometimes spatulately broadened at apex, obtuse, with or without narrow membranous border; inner bracts not more than 1.5 times as long as outer, usually all bracts equal. Receptacle

¹Treatment by N.N. Tzvelev.

²From the Greek words: *coleos*—sheath, and *stephos*—crown. Named for the strongly truncate sheath-like pappus of the achenes.

strongly convex, obtusely conical, plump, lacking scales, slightly punctate-tuberculate. Corolla of ligulate florets yellow, with strongly flattened but wingless, about 1.5 mm-long tube and 6–15 mm-long, oblong or linear limb; corolla of tubular disk florets yellow, 2–3 mm long, with tube narrower in lower half, strongly and rather abruptly broadened in upper half, with 5 weakly curved triangular teeth, $1/6-1/5$ as long as tube. Filaments apically thickened; anthers lacking basal appendages, but with lanceolate-ovoid, subacute apical appendage; pollen grains spherical, spiny. Style bifid; branches linear, truncate. All achenes similar (but undeveloped in ligulate florets), glabrous, 1.8–2.0 mm long and about 0.7 mm wide, almost terete, narrowed toward base, with 8–10 somewhat prominent longitudinal ribs and very loose hull of achenes, pappus as 1.2–1.8 mm long corona, usually obliquely truncate over more than a half its length dorsally, auriculate. Corona of ligulate florets large, somewhat funnel-shaped at throat.

Glabrous or weakly pubescent (pubescence of simple curly hairs) annuals with a tap root, erect, usually weakly branched stem and alternate, entire, more or less toothed leaves.

Of the seven species of this genus, distributed primarily in the countries of the western Mediterranean and the Canary Islands, one species is a widely distributed Mediterranean weed.

147 Type of genus: *Coleostephus myconis* (L.) Cass.

Note. The name *Myconia* Necker, *Elem.* I (1790) 22, used by some authors for this genus, is not the generic name, but a monomial name of the species and, therefore, cannot be accepted as having priority.

1. **L. myconis** (L.) Cass. in Dict. Sc. Nat. XLI (1826) 43.—*Chrysanthemum myconis* L. Sp. pl. ed. 2 (1763) 1254; Boiss. Fl. or. III, 335.—*Matricaria myconis* (L.) Desr. in Lam. Encycl. meth. III (1792) 736.—*Pyrethrum myconis* (L.) Moench, Suppl. (1802) 247; DC. Prodr. VI, 61; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2 (1883) 455; Schmalh. Fl. II, 70.—*Myconia chrysanthemum* Sch. Bip. in Webb and Benth. Phyt. Canar. II (1842) 247.—*M. myconis* (L.) Briq. and Cavil. in Burnat. Fl. Alp. Marit. VI, 1 (1916) 77.—**IC.**: Rchb. Ic. Fl. Germ. XVI (1853) t. 986; Hegi, Ill. Fl. VI, 2 (1929) fig. 307.

Annual. Glabrous or weakly hairy, 10–40 cm high plant, with short tap root and erect simple or sparingly branched stem. Leaves lacking punctate glandular hairs, entire, more or less serrate-dentate; basal leaves on rather long petioles, with broadly oval lamina cuneately narrowed toward base, withering early; cauline leaves usually numerous, sessile, to 6 cm long, oval or oblong, cuneately narrowed toward base. Capitula solitary or 2–15, one each at apices of main stem and its leafy

branches, on rather long peduncles. Involucre 8–10 mm in dia and 4–6 mm long; involucre bracts almost equal. Corolla of ligulate florets yellow, with about 1.5 mm-long tube and 6–15 mm-long limb; corolla of tubular florets 2–3 mm long. Achenes 1.8–2.0 mm long, with obliquely truncate, auriculate, 1.2–1.8 mm long apical corona. Flowering May to July.

By roadsides, in crops as a weed.—*European part*: Crimea (reported from the vicinity of Sevastopol, not found at present). *General distribution*: Mediterranean Region, Balkans-Asia Minor, Central Europe (as an introduced plant in Germany and Czechoslovakia). Described from Southwestern Europe. Type in London.

GENUS 1525. *Matricaria* L.^{1,2}

L. Sp. pl. (1763) 1256.

Achenes small, (0.5)0.8–1.0(2.0) mm long, 0.25–0.5 mm wide, cylindrical, laterally compressed, dorsally convex, obliquely truncate at apex, with 3–4 thin ribs on ventral side, somewhat distant, brown or light brown, smooth, without or with scarcely visible coronate, toothed pappus. Capitula heterogamous or often homogamous (lacking peripheral ligulate florets); peripheral ligulate florets pistillate, with short, white, decurved ligules; tubular disk florets 4–5, spatulate, yellow or greenish, with erect tube, narrow or swollen from middle. Anthers with deltoid acute apical appendages. Receptacle fistular, often conical.

Annual herbs always aromatic with twice pinnate or pinnate leaves.

Type of genus: *M. recutita* L.

1. Capitula with peripheral ligulate florets having white ligules 2.
- + Capitula homogamous, with only tubular florets 3.
2. Stem erect, 10–30 cm high; corona 10–20 mm in diameter; plants wholly glabrous 1. ***M. recutita* L.**
- + Stem ascending, 8–15 cm high; capitula 7–10 mm in dia, whole plant more or less hairy; leaves less divided 2. ***M. tzvelevii* Pobed.**
3. Florets greenish, with tube without constriction; involucre bracts white and lustrous along margin; achenes with scarcely visible, white, toothed pappus or lacking it 3. ***M. matricarioides* (Less.) Porter ex Britton**

¹Treatment by E.G. Pobedimova.

²From the Latin word: *mater*—mother, named for the use of the plant in women's diseases.

- + Florets yellow, with tube swollen and constricted in middle; involu-
cral bracts brownish along margin, less often whitish; achenes lack-
ing pappus 4. **M. aurea** (L.) Boiss.

Section 1. Matricaria Sch. Bip. Ueb. die Tanacet. (1844) 24.—*Chamomilla* DC. Prodr. VI (1837) 51, p. p.—*Capitula heterogamous*, tubular florets 5-lobed; pappus absent, or less often as scarcely visible toothed corona.

Type of section: type of genus.

1. **M. recutita** L. Sp. pl. (1753) 891.—*M. chamomilla* L. Sp. pl. (1763) 1256; Georgi Besch. d. Russ. R. IV, 3, 1253; MB. Fl. taur.-cauc. II, 327; Ldb. Fl. Alt. IV, 114; DC. Prodr. VI, 50; Ldb. Fl. Ross. II, 515; Boiss. Fl. or. III, 323; O. and B. Fedtsch. Perech. Rast. Turk. IV, 184; Grossh. Fl. Kavk. IV, 126.—*Chrysanthemum chamomilla* Patze, Mey. Elkan. Fl. Prov. Preuss. (1850) 304; Schmalh. Fl. II, 67.—*Matricaria deflexa* Gilib. Fl. Lithuan. III (1785) 221; Ej. Exerc. Phytol. I (1792) 179.—**lc.**: Majeovski, Fl. (1954) 580; Fedtsch. and Fler. Evrop. Ross. 973; Kom. Sbor, Sushka i Razved. Lek. Rast. ed. 3, Plate 35.—**Exs.**: Pl. Finl. exs. No. 390 and No. 978 p. p.; Fl. Polon. exs. No. 744; Fl. Aust.-Hung. No. 3788; Fl. exs. Reip. Boh.-Sloven. Nos. 946, 1276; Fl. Stiriaca exs. No. 687; Fl. Gal. et Germ. exs. No. 1235.

- 149 Annual. Whole plant glabrous, stem 10–30 cm; high, branched from base or mainly sulcate in inflorescence, leafy up to top. Leaves oblong, 15(20–30)60 mm long, 5(10–15)18 mm wide, pinnatisect or twice pinnately cut into narrow-linear lobes with short cusp, sessile, slightly broadened at base. Inflorescence corymbose; capitula on rather long peduncles, 1.2(3.0–5.0) 6.5 cm long, heterogamous. Receptacle oblong-conical, fistular. Involucral bracts usually 1-seriate, green, obtuse, whitish-membranous along margin, lacking teeth. Ligules of ligulate florets recurved, white; disk florets yellow, with 5-toothed long tube. Achenes very small, 0.8–1.0 mm long, 0.25 mm wide, concave, laterally compressed, obliquely truncate at apex, smooth, with 3 thin, white, similar ribs, extending ventrally, dorsally smooth, brown; pappus absent, less often as scarcely visible toothed corona. Flowering May to September.

In fields, near residential buildings, in kitchen gardens, weedy places.—*European part*: All regions; *Caucasus*: Ciscaucasia, Dagestan; *Western Siberia*: Ob River Area, Upper Tobol, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: Okhotsk, Uda River Area, Ussuri (very rarely); *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Tien Shan. *General distribution*: Scandinavia, Central Europe, Atlantic Europe, western Mediterranean

Region, Balkans-Asia Minor, North America. Described from Western Europe. Type in London.

Economic Importance. The flowers contain 0.5–0.12% essential oil, anthemic acid, and glucoside. The oil contains azulene, 2 sesquiterpenes and sequiterpenic alcohol. Used in medicine internally as a diaphoretic and anticonvulsive preparation, and externally as an emollient in the form of a poultice, rinse, etc. (*Entsikl. slovar' lekarstv. e'firnomasl., i yadovitykh rast.* 1951)*. In the literature (*Grossh. Rast. bogat. kavk.*, **2nd ed., 1952, pp. 222 and 253), it is reported as a plant containing small quantities of vitamins A and C.

2. *M. tzvelevii* Pobed. in Addenda, XXV, 871.

Annual. Roots short, very hard toward autumn; stem slender, repeatedly branched from base, 8–15 cm high, covered with short scattered pubescence of setose straight hairs, later with pubescence only below capitula. Leaves oblong, 15–20 mm long, 3–5 mm wide, imparipinnate with 3–4 pairs of simple, somewhat thick, terete, white-mucronate leaflets sparsely short-setose or glabrous, scattered over stem and lateral branches; upper leaves with 1–2 pairs of leaflets, or upper leaves entirely linear. Peduncles 2.0–5.5 cm long, slender, with one capitulum each. Capitula 7–10 mm in dia. Receptacle narrow-conical, fistular, covered with fine white protuberances at points of attachment of florets. Involucre usually 1-seriate; involucre bracts broadly elliptical, with wide, white-membranous, often erose margin. Peripheral florets ligulate, pistillate, with short, wide, white ligules, 1.5–3.0 mm long, 1.5 mm wide, three-toothed at apex, middle tooth 150 shorter than laterals recurved by flowering; disk florets tubular, with 5 more or less deltoid, yellow lobes and greenish tube, constricted in middle. Anthers with very small lanceolate apical appendages. Style of peripheral florets strongly exerted from tube, bifid at apex; style of disk florets more or less included in staminal tube. Achenes 1.5 mm long, 0.5 mm wide, terete, laterally compressed, obliquely truncate at apex, with 5 thin ribs, lacking pappus. Flowering August.

Found on rubbly mountain slopes.—*European Part*: Crimea. Endemic. Described from southern Crimea (Bolvan Mountain in Sudak District). Type in Leningrad.

Section 2. Anactidea DC. Prodr. VI (1837) 50.—Capitula only with tubular florets; corolla 4-lobed; pappus absent or with very short entire corona.

*Encyclopedic Dictionary of Medicinal, Essential Oil and Poisonous Plants—Translator.

**Plant Wealth of the Caucasus—Translator.

Type of section: *Matricaria matricarioides* (Less.) Brit.

3. **M. matricarioides** (Less.) Porter ex Britton in Mem. Torrey Bot. Club. V (1884) 341; Majevski, Fl. (1954) 580.—*Artemisia matricarioides* Less. in Linnaea, VI (1831) 210 (excl. syn.).—*Matricaria discoidea* DC. Prodr. VI (1837) 50; Ldb. Fl. Ross. II, 544.—*Chrysanthemum suaveolens* Aschers. ex Schmalh. Fl. II (1897) 68.—*Matricaria suaveolens* (Pursch) Bush. Fl. Northwest. Tiefebene (1894) 496; Grossh. Fl. Kavk. IV, 126.—*Cotula matricarioides* Bong. Obs. veget. Sitcha (1832) 147.—*Tanacetum suaveolens* Hook. Fl. bor. am. I (1833) 327, tab. 110.—**lc.**: Syreistsch. Ill. Fl. Mosk. Gub. III (1910) 270; Kom. and Alis. Opred. Rast. Dal'nevost. Kr. II, Plate 306.—**Exs.**: Fl. pol. exs. No. 180; GRF No. 464a, b; Pl. Finl. exs. No. 979.

Annual. Root thick, with numerous slender branches. Stem solitary or few, erect, 5–30 cm high, mostly branched in upper half, fistular, glabrous, sometimes pubescent only below capitula. Leaves oblong, 30(40–50)60 cm long, 5(15–18)20 mm wide, twice pinnate, divided into linear, short, cuspidate segments, basally broadened and slightly amplexicaul, glabrous. Inflorescence corymbose, at apices of main stem and branches; peduncles short, 5–10–15 mm long, with single capitulum. Capitula 7–15 mm in dia, with ovoid-conical, glabrous receptacle. Involucral bracts 3-seriate, elliptical, obtuse, with wide, white, lustrous, membranous margin. Florets homogamous, tubular, greenish yellow, 4-lobed, tube not extended. Achenes oblong, 1.25–1.5–2.0 mm long, 0.5 mm wide, slightly curved at apex, weakly truncate obliquely, dorsally smooth, brownish, ventrally with 3 thin ribs, laterally reddish, especially above, pappus absent or with scarcely visible toothed corona. Flowering July to October.

In fields and meadows, roadsides, in gardens, near houses, as a weed and introduced plant, growing wild along river banks, in river valleys and along seacoasts.—**Arctic**: Chukotka; **European part**: All regions; **Caucasus**: Eastern and Western Transcaucasia; **Western Siberia**: Upper Tobol, Irtysh; **Eastern Siberia**: Sakhalin, Kuril Islands (wild), Lena-Kolyma, Angara-Sayans, Dauria, **Far East**: All regions (wild); **Soviet Central Asia**: Lake Balkhash Region. **General distribution**: Scandinavia, Central Europe, eastern Mediterranean Region, North America, [?New] Zealand. Described from Unalaska.

Note 1. It grows naturally in Northeast Asia and Northwest America. In Europe, it is a weed which has spread widely from cultivation in gardens, where it was introduced in the middle of the last century.

Note 2. The plant from Lake Khanka (upper reaches of Odarka River), collected by Chersky on July 21, 1911, is distinguished by

having very small capitula, a narrow conical receptacle, and small leaves. It differs sharply from the Far Eastern specimens and possibly represents an ecological form.

Economic Importance. Used as a medicinal plant like *M. recutita*.

4. *M. aurea* (L.) Boiss. Fl. or. III (1875) 324; Grossh. Fl. Kavk. IV, 126.—*M. raddeana* Winkl. in Tr. Peterb. Bot. Sada, XI (1890) 122; O. and B. Fedtsch. Perech. Rast. Turk. IV, 184.—*Cotula aurea* L. Sp. pl. (1763) 1257; DC. Prodr. VI, 78.—*Anacyclus aureus* Lam. Ill. (1797) t. 700, non L.—**lc.**: Lam. ibid.: Fiori and Paol. Ic. Fl. Ital. 418; Winkl. op. cit. Plate 3, Fig. 2.—**Exs.**: GRF No. 3262 (sub *M. raddeana* Winkl.).

Annual. Root slender, weak, with numerous branches. Stems 4–20 cm high, prostrate or ascending, solitary or numerous, branched, glabrous, sometimes sparsely pubescent below inflorescence, sulcate. Leaves oblong 7(15–20)50 mm long, 3(4–7)10 mm wide, pinnate, with simple thin segments or deeply divided into thin, subacute lobes, sessile, semiamplexicaul, basally broadened, glabrous. Capitula on more or less long or short leafless or sparsely leafy, glabrous or sparsely pubescent peduncles, small, 4(5–6)8 mm in dia. Receptacle ovoid. Involucral bracts elliptical, obtuse, green, with wide, especially at apex, brown and whitish membranous margin. All florets tubular, yellow, 4-lobed, with tube constricted in middle, lower or upper part of tube swollen. Achenes small, 0.5 mm long and 0.25 mm wide, oblong, sharply obliquely truncate at apex, laterally compressed, brown, smooth, with 3–4 white, thin, sharp ribs running ventrally, lacking pappus, in isolated cases with long pappus. Flowering March to May. (Plate VII, Fig. 3).

On limestone deposits, sands, saline lands, flood-plain meadows with stony soil, sometimes as weed.—*Caucasus*: Eastern Transcaucasia, Dagestan; *Soviet Central Asia*: Kara-Kum, mountainous Turkmenia, Pamiro-Alai. *General distribution*: Atlantic Europe, Eastern and Western Mediterranean Regions, Balkans-Asia Minor, Iran.

Note. Apparently, in describing *M. raddeana* Winkler was not aware of *M. aurea*, because he compares his new species only with *M. matricarioides* (*M. discoidea*, by his nomenclature), from which *M.*
 152 *raddeana*, of course, is well distinguished. It must be noted that the stems of *M. raddeana* plants are more erect than in *M. aurea* and are not prostrate, the achenes are slightly less curved with broader ribs. These small characters vary and cannot be used to distinguish them.

GENUS 1526. *Microcephala* Pobed.^{1,2}

Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1960) 356.

Achenes 1.0–1.5 mm long, 0.25–0.5 mm wide, terete laterally compressed, dorsally slightly convex, with one thin rib, obliquely truncate at apex, with 3–5 thin ribs on ventral side, brownish, more or less densely covered with small white scales or papillae, sometimes also pubescent, with large, a half as long as achene or slightly more, membranous, sharply lobed, inequilateral pappus. Capitula heterogamous; peripheral ligulate florets pistillate, with short, wide, white ligules, uncate at end of anthesis; tubular disk florets usually with short tube, inflated in lower half and enclosed by long pappus. Anther appendages ovoid, almost half as long as anther. Receptacle conical or hemispherical.

Small annual herbs of desert and semidesert areas with pectinate-pinnate or divided leaves, and villous pubescence on both sides.

Type of genus: *M. lamellata* (Bge.) Pobed.

- 1. Capitula lacking outer ligulate florets, very rarely with them 3. *M. subglobosa* (Krasch.) Pobed.
- + Capitula with outer ligulate florets 2.
- 2. Pappus of achenes 10-lobed, inequilateral, dorsally longer; capitula small, 5–15 mm in dia. Plants 3–15 cm high, sparingly branched, with more or less pubescent leaves 1. *M. lamellata* (Bge.) Pobed.
- + Pappus of achenes 6–7 lobed or entire, ventrally longer; capitula (8)15–17(22) mm in dia. Plants (10)15–20(30) cm high, weakly pubescent 2. *M. turcomanica* (Winkl.) Pobed.

- 155 1. *M. lamellata* (Bge.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 357.—*Matricaria lamellata* Bge. in Mém. Sav. étr. Pétersb. VII (1854) 335; Trautv. in Tr. Peterb. Bot. Sada, I, 274; IX, 456; O. and B. Fedtsch. Perech. Rast. Turk. IV, 185.—*M. lamellata* var. *discoidea* Winkl. in Tr. Peterb. Bot. Sada, XI (1889) 121.—*Chamaemelum lamellatum* Boiss. Fl. or. III (1875) 326.—*Tripleurospermum lamellatum* (Bge.) K. Rech. in Oest. Bot. Zeitschr. XCVII (1950) 233 in obs.—*lc.*: Paulsen, Stud. Veg. Pamir. (1912) 62; Bot. Tidsskr. XXXII (1912) 53.—*Exs.*: H.F.A.M. No. 192; GRF No. 1873.

¹Treatment by E.G. Pobedimova.

²From Greek words: *micros*—small, and *cephalon*—head.

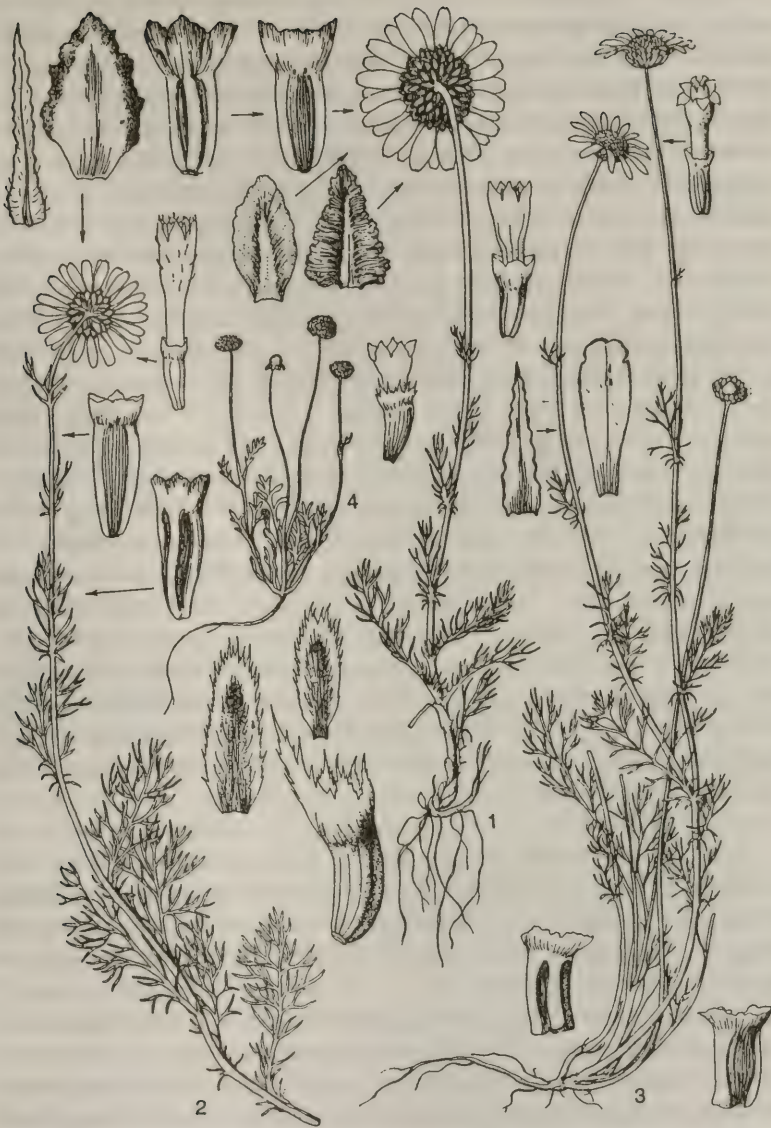


Plate V.

1 — *Tripleurospermum subnivale* Pobed., habit of plant, involucre bracts, bisexual floret, dorsal and ventral view of achene; 2 — *T. szovitzii* (DC.) Pobed., habit of plant, involucre bracts, bisexual floret, dorsal and ventral view of achene; 3 — *T. elongatum* (F. and M.) Bornm., habit of plant, involucre bracts, bisexual florets, dorsal and ventral view of achene; 4 — *Microcephala subglobosa* (Krasch.) Pobed., habit of plant, involucre bracts, bisexual floret, achene.

Annual. Plants grayish, villous with white hairs. Stem (3.5)8–10(15) cm high, weakly branched almost from base, villous. Leaves oblong, (10)15–25(30) mm long, (3)5–10(12) mm wide, pectinate-pinnate or divided into linear or lanceolate, short, and apiculate segments, villous on both sides, petiolate; uppermost leaves usually entire, linear. Capitula solitary, 5–15 mm in dia, on long, densely white-pubescent peduncles. Receptacle conical, acute, narrowed, finely tuberculate. Involucre patelliform; involucre bracts oblong-linear, slightly broadened toward apex, inner narrowed toward base, almost transparent, with wide, white membranous border, densely white-tomentose-lanate, ciliate. Capitula heterogamous, with smell of chamomile; peripheral florets pistillate, with white, wide, small ligule, 2.0–2.5–3.0 mm long, 2 mm wide, usually decurved, especially after anthesis, unequally 3-toothed at apex, tubular florets 5-parted, lemon-yellow, 2.5–3.0–3.5 mm long, tube strongly constricted in middle, swollen lower half usually enclosed by pappus. Anther appendages ovoid, almost a half as long as anther. Achenes laterally compressed, dorsally curved, 1.0–1.5 mm long, 0.25–0.5 mm wide, with 4–6 ribs, densely white-squamulose; pappus 0.5 mm long, inequilateral, dorsally longer, 10-lobed, lobes acuminate, dentate-serrate; seeds not fused with pericarp, easily separating on soaking, fusiform, brown, 1 mm long. Flowering April to November.

In saline and sandy deserts and semideserts, on takyrs, in steppes, and as weed in crops.—*Soviet Central Asia*: Aralo-Caspian, Lake Balkhash Region, Kyzyl-Kum, Kara-Kum Amu-Darya, Syr-Darya, Pamiro-Alai, Tien Shan. Described from southern Kyzyl-Kum (coll. Agatma). Type in Paris.

2. **M. turcomanica** (Winkl.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 357.—*Matricaria turcomanica* (Winkl.) Pobed. Fl. Turkm. VII (1960) 95.—*M. lamellata* var. *turcomanica* Winkl. in Tr. Peterb. Bot. Sada, XI (1889) 121; O. and B. Fedtsch. Perech. Rast. Turk. IV, 185.

156 Annual. Plants green, weakly pubescent. Stem (10)15–20(30) cm high, strongly branched from base, sparsely or densely pubescent. Leaves oblong, (17)20–25(60) mm long, (8)10–15(35) mm wide, gradually reduced upward, pinnate, with more or less oblong, 5–10 mm long linear segments, in turn usually divided, subacute, green, very weakly pubescent or grayish-lanate. Capitula solitary, (8)15–17(22) mm in dia, on long, weakly pubescent peduncles thickened and densely pubescent above. Receptacle ovoid, acute, slightly narrowed at apex, brownish. Involucre patelliform; involucre bracts oblong-linear, 2.5–5.0 mm long, 1.5–2.0 mm wide, slightly broader above, green, weakly carinate, with wide, white-membranous border, glabrous or subglabrous,

ciliate. Capitula heterogamous, with smell of chamomile; peripheral florets pistillate, with 4–6 mm-long and 2–4 mm-wide white ligules, always decurved after anthesis, usually spreading at anthesis, unequally 3-toothed at apex; tubular florets lemon-yellow, 2–3 mm long, strongly constricted in middle, swollen lower half of tube enclosed by pappus. Anther appendages ovoid, almost a half as long as anther. Achenes weakly compressed laterally, with 4 ribs on ventral side and usually 5 on dorsal, 1.0–1.5 mm long, 0.25–0.5 mm wide, broader part densely, white-squamulose; pappus 0.5 mm long, inequilateral, ventrally longer with 6–7 acuminate lobes. Flowering April to May.

In white haloxylon forests, sandy deserts.—*Soviet Central Asia*: Kara-Kum, Pamiro-Alai. *General distribution*: Iran. Described from southern Turkmenia (between Ashkhabad and Merv). Type in Leningrad.

3. **M. subglobosa** (Krasch.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 358.—*Matricaria subglobosa* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1936) 345.—*M. lamellata* var. *discoidea* Rgl. in sched.—*Pyrethrum discoideum* Winkl. in sched. non Ldb.

Annual. Stem 3–15 cm high, simple or branched almost from base, with slender, erect branches, sparsely white-lanate. Leaves succulent, oblong, (8)10–15(30) cm long, (2)5–7(10) cm wide, pinnate, with short linear or lanceolate acute segments, sparsely grayish-lanate, partly green, petiolate; uppermost leaves linear, entire. Capitula solitary, 4–10 mm in dia, on long, sparsely, less often densely pubescent peduncles, thickened and more strongly pubescent above. Receptacle hemispherical, less often slightly oblong, obtuse, finely tuberculate. Involucre patelliform; involucre bracts oblong-linear, narrow, slightly recurved, broader at apex, green with more or less narrow membranous border, weakly pubescent. All florets only tubular, very rarely white; ligulate
157 (f. *radiata* Krasch.), lemon-yellow, with smell of chamomile, slightly constricted in middle, lower half of tube not inflated and not enclosed entirely by pappus. Anther appendages ovate, acute, almost a half as long as anther. Achenes slightly convex on outside, with 3–4 scarcely visible ribs on ventral side, 1.0–1.5 mm long, 0.25–0.5 mm wide, densely white-squamose in broader part; pappus 0.5 mm long, inequilateral, with longer margin pointing ventrally, not deeply lobed, lobes acuminate. Flowering April to June. (Plate V, Fig. 4).

In clayey or sandy deserts, alkaline meadows, haloxylon forests on sands.—*Soviet Central Asia*: Lake Balkhash Region. Described from Kazakhstan (Alekseevka on the Chu River). Type in Leningrad.

Note. This northeastern race of *M. lamellata* (Bge.) Pobed. is distinguished by the absence (with rare exceptions) of ligulate florets, a hemispherical or slightly elongated, rounded receptacle, a uniformly broad corolla tube, a pappus with the elongated part turned to the ventral and not the dorsal side, as well as weaker pubescence on the plant as a whole.

GENUS 1527. *Tripleurospermum* Sch. Bip.^{1,2}

Schult. Bip. Ueb. die Tanacet. (1844) 31.—*Chamaemelum* Vis. Oss. Matric. an. 1, 2 (1844) 24, non Mill. 1754.

Achenes large, 1.25–3.0 mm long, 0.25–1.0 mm in dia above, cylindrical-triangular, dorsoventrally compressed, dorsally convex, with 2 red resinous glandular hairs at apex, carinate-ribbed laterally and ventrally, with 3 large, cartilaginous, corniculate, whitish ribs (less often with fourth and fifth thin, scarcely visible ribs, on dorsal side), brownish-black or light brown, usually rugose, less often smooth, with coronate, short and entire, or long, membranous, lobed; pappus, usually weakly or strongly prominent laterally. Capitula many-flowered, heterogamous peripheral florets pistillate, 1-seriate, less often absent; disk florets bisexual, tubular, 5-toothed, with ovate-deltoid yellow teeth, usually with resinous reddish-brown dots at apex. Anthers with ovate-deltoid or globose apical appendages.

Annual or biennial herbs with large branches and twice or thrice pinnate leaves with linear, lanceolate or ovate, deeply divided segments. Species of this genus grow only in the Northern Hemisphere where, together with exotic species, they number about 30.

Type of genus: *T. inodorum* (L.) Sch. Bip.

158 It is difficult to determine the exact number of species of this genus in the absence of a detailed study of the entire genus, because often *Tripleurospermum* species have been included in the genera *Pyrethrum*, *Chrysanthemum*, *Matricaria*, *Chamaemelum*, etc.

However, the genus *Tripleurospermum* is morphologically quite well defined and easily recognized by the structure of the achenes, but the study of its species only on the basis of herbarium material is extremely difficult. With reason, An.A. Fedorov writes, "... often you see the most incorrect identifications made by both beginning botanists and well known specialists, who evidently have fallen victim to equally

¹Treatment by E.G. Pobedimova.

²From Greek words: *treis*—three, *pleura*—rib, and *sperma*—seed; named for the 3-ribbed achenes.

gross mistakes in identifying species of this genus" [Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, 11 (1949) 165]. For an exact identification of herbarium specimens of this genus, it is essential that material be collected not only in full flower but also with fruits. The study of the pappus (a good taxonomic character for distinguishing species of the genus *Tripleurospermum*) on ovaries of still young florets does not give a correct idea, because the pappus changes as the achene matures. The shape of the receptacle, a character no less important in the genus, is difficult to determine without damaging the herbarium specimen. Having strong superficial similarity, the species of this genus often appear, in the nature of the receptacle, florets, and achenes, not only different but even as members of different genera. Only a careful study of the species in nature based on a large quantity of material in different developmental stages will enable taxonomists to form a correct concept of their number and geographic distribution. Since I could study only a few *Tripleurospermum* species in nature, I believe that even my study is not without potential error.

1. Plants perennial with slender woody rhizome 2.
- + Plants annual or biennial 12.
2. Stem simple, with single capitulum 3.
- + Stem branched, with few capitula (less often simple). 8.
3. Involucral bracts with dark brown and black membranous margin 4.
- + Involucral bracts with narrow, brown, membranous margin or green, with light colored membranous margin 6.
4. Capitula small, 15–20 mm in dia; involucral bracts with narrow, brown membranous margin; pappus long, a half as long as achene or slightly longer, dark brown all over or only at apex. Plants small, 3.5–17 cm high 3. **T. grossheimii** (An. Fed.) Pobed.
- + Capitula large, 20–45 mm in dia; involucral bracts with broad, blackish-brown, membranous margin; pappus shorter, a third to a half as long as achene, with dark brown margin of lobes. Plants up to 40 cm high. 5.
5. Capitula with large broad involucre, 15–20 mm in dia; involucral bracts black-bordered; outer florets white, 25–35 in capitulum, with short and broad, 13–15 mm long and 5–6 mm wide ligule 2. **T. subnivale** Pobed.
- + Capitula with smaller and narrower involucre, 10–15 mm in dia; involucral bracts brown-bordered, outer florets white, 20(30–35)38 in capitulum, with narrower, 9–15 mm long and 2–5 mm wide, ligules 1. **T. caucasicum** (Willd.) Hayek.

6. Involucral bracts with narrow, brown, membranous margin; leaves covering lower half of stem, hard, somewhat thick, twice or thrice-pinnately cut into narrow, linear somewhat long secondary lobes 7.
- + Involucral bracts green, with light-colored margin; leaves only at base, pinnately cut, with segments palmate or pinnately divided into lanceolate, short and broad secondary lobes 13. **T. colchicum** (Mand.) Pobed.
7. Stem 15–30 cm high; capitula large, 2.5–4 cm in dia, leaf lobes oblong; achenes with single thin rib on dorsal side. Plants of alpine meadows 4. **T. szovitzii** (DC.) Pobed.
- + Stem 15 cm high; capitula 2–3 cm in dia; leaf lobes reduced; achenes dorsally not ribbed. Plants of stony slopes in lower mountain zone 14. **T. tchichatchevii** Boiss.
8. Involucral bracts with dark brown margin 9.
- + Involucral bracts green or with scarious margin, sometimes with very narrow brown margin 11.
9. Receptacle conical; involucral bracts with narrow dark brown margin 7. **T. ambiguum** (Ldb.) Fr. and Sav.
- + Receptacle hemispherical; involucral bracts with more or less wide, dark brown margin 10.
10. Leaves narrow, divided in long and narrow lobes; peduncles long; involucral bracts narrow; ligules of peripheral florets 12–15 mm long, 2–3 mm wide 5. **T. transcaucasicum** (Manden.) Pobed.
- + Leaves broader, divided in short and broad lobes; peduncles shorter; involucral bracts broader; ligules of peripheral florets broader, 12–15 mm long, 3–5 mm wide 6. **T. karjagini** (Mand. and Sof.) Pobed.
11. Leaves ovate-oblong, broad, 80–90 mm long, 50–90 mm wide, pinnately cut or twice-pinnate; achenes smooth; pappus white, a third as long as achene ... 12. **T. rupestre** (Somm. and Lev.) Pobed.
- + Leaves oblong, thrice-pinnate; achenes rugose, pappus white, longer on ventral side, a third as long as achene 11. **T. elongatum** (F. and M.) Bornm.
- 12(1). Achenes with long, white, two-lobed pappus; middle rib columnar, covering almost entire ventral side. Plants 10–30 cm high 22. **T. parviflorum** (Willd.) Pobed.
- + Achenes lacking pappus, or pappus less than a fourth as long as achene 13.
13. Achenes light colored, smooth, with 3 very thin, white ribs 14.
- + Achenes dark brown, rugose 15.
14. Achenes without pappus, with 2 small glandular hairs on dorsal side; margin of outer involucral bracts broadly white-membranous; capitula usually lacking peripheral florets (if with peripheral florets,

- then ligules very short, usually exerted from involucre)
 19. **T. disciforme** (C.A.M.) Sch. Bip.
- + Achenes with short, white, membranous, lobed pappus, with 2 large glandular hairs on dorsal side; margin of outer involucre bracts narrow and pale-brown, membranous; capitulum with large peripheral florets (two times as long as involucre)
 21. **T. sevanense** (Mand.) Pobed.
15. Pappus white, membranous, lobed
 20. **T. decipiens** (Fisch. and Mey.) Bornm.
- + Pappus as small, cartilaginous, toothed border. 16.
16. Involucre bracts with more or less wide, brown or blackish-brown margin 17.
- + Involucre bracts with whitish, light brown or brown, but then very narrow margin 18.
17. Green part of involucre bracts deltoid; leaves bipinnate, oblong; stem erect, sparingly branched, sometimes with more branches
 9. **T. phaeocephalum** (Rupr.) Pobed.
- + Green part of involucre bracts oblong or narrowed in middle, border narrower than green part, blackish-brown in lower part, light brown at apex; leaves bipinnate, obovate; stem strongly branched
 10. **T. subpolare** Pobed.
18. Involucre bracts with very narrow, brown margin 19.
- + Involucre bracts with white, lustrous or light brown border apically broadened 20.
19. Receptacle hemispherical; leaves succulent, thrice pinnately cut into short thick pinnules. Plants of the Baltic Coast, 10–40 cm high ...
 16. **T. maritimum** (L.) Koch
- + Receptacle conical; leaves twice or thrice pinnately cut into narrow filiform pinnules. Plants of the Pacific Coast, 10–50 cm high
 8. **T. tetragonospermum** (F. Schm.) Pobed.
20. Involucre bracts with white lustrous margin 21.
- + Involucre bracts with light brown, apically broadened border, or with narrow white margin; outer bracts often pale green, lacking membranous margin 15. **T. inodorum** (L.) Sch. Bip.
21. Capitula 10–15 mm in dia; stem 8–30 cm high, branched from base
 17. **T. limosum** (Maxim.) Pobed.
- + Capitula 18 mm in dia; stem 40 cm high, branched only in upper half 18. **T. breviradiatum** (Ldb.) Pobed.

161 *Subgenus 1. Chionogeton* Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1960) 344.—Achenes with more or less long pappus, a third to a half as long as achene, usually three-lobed; capitula solitary, very large, less often few; involucre bracts often with more or less wide, black or white, membranous margin; stem usually simple,

less often with few short branches. Perennial herbs with woody, slender, branched rhizome, usually growing in alpine zone in high-mountain moist meadows and near patches with snow.

Note. Besides our species, *T. melanophyllum* (Babel.) Pobed. from northern Iran also belongs to this subgenus.

Type of subgenus: *Tripleurospermum caucasicum* (Willd.) Hayek.

Series 1. Caucasica Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1960) 344.—Stem simple; margin of involucre bracts wide, membranous, blackish or dark brown; pappus long, almost a half as long as achene, entirely brown or with brown lobes.

1. **T. caucasicum** (Willd.) Hayek in Denkschr. Akad. Wiss. Wien, Math.-Nath. Kl. XCIX (1924) 204.—*Tripleurospermum caucasicum* Owerin in Zap. Kavk. Obshch. Sel'sk. Khoz. God 20, Nos. 4, 5, 6 (1874) 138, 141 and 150.—*Pyrethrum caucasicum* Willd. Sp. pl. III (1800) 2156; MB. Fl. taur.-cauc. II, 322, III, 577; DC. Prodr. VI, 56; C.A.M. Verz. 75; Ldb. Fl. Ross. II, 548.—*Anthemis caucasica* Adam, in Weber and Mohr Beitr. I (1805) 71.—*Chrysanthemum alpinum* MB. Casp. (1800) 211, nom. nud.; Georgi Besch. d. Russ. R. III, 5, 1250.—*C. caucasicum* Pers. Syn. II (1807) 462; Wehrh. Gartenstauden, II, 1101.—*Tanacetum caucasicum* Sch. Bip. Ueb. die Tanac. (1844) 60.—*Chamaemelum caucasicum* Boiss. Diagn. Ser. I, XI (1849) 20; Boiss. Fl. or. III, 331 p. p.; Grossh. Fl. Kavk. IV, 128.—**lc.**: Meissner in Gartenwelt, XXXIV (1930) 385.—**Exs.**: Woron. Pl. abch. exs. Nos. 583, 598; GRF No. 3246.

Perennial. Rhizome woody, dark brown, usually branched near tip; stems few, 20–40 cm high, erect, simple, less often branched, glabrous, pubescent only below capitula, sulcate throughout, usually leafy in lower half, leafless in upper third. Leaves oblong, bipinnate with narrow, oblong, linear, acute or subobtuse segments, glabrous; basal leaves and those on vegetative branches 30(40–50)70 mm long, 10(15)–20 mm wide, petiolate, (petioles 15–30 mm long); cauline leaves 10(20)–25 mm long, 6–10 mm wide, sessile, with rachis broadened at base, bearing short linear segments. Capitula solitary, 30–45 mm in dia with peripheral florets. Receptacle hemispherical. Involucre 10–15 mm in dia; bracts oblong, obtuse, broadly brown membranous along margin, glabrous. Peripheral florets 20(30–35)38 in capitulum; ligules white, 9–15 mm long, 2–5 mm wide, obtuse, with 3 shallow teeth; tubular florets yellow, with short infundibuliform tube and deltoid, acute or broadly deltoid, subobtuse lobes, sometimes apically dark brown. Stigma deeply divided. Anther appendages conical with uncate apex. Achenes oblong-linear, smooth, 2–3 mm long, 0.75–1.0 mm wide,

with 3 thick white ribs, reddish glands on outside, inconspicuous; pappus a third to half as long as achene, deeply three-lobed ventrally, with long deeply toothed border on outside equaling lobes; pappus brown entirely or only at apex. Flowering June to September.

On moraines, along borders of glaciers, near patches of snow in alpine zone.—*Caucasus*: Ciscaucasia, Eastern, Western and Southern Transcaucasia, Dagestan. *General distribution*: Armenia-Kurdistan, Balkans-Asia Minor (Bulgaria)? Described from Caucasus. Type in London?

Note. One specimen of this species with the label "Caucasus, Mussin-Puschkin," apparently from the authentic material, is preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR. In describing this species, Willdenow included "*Chrysanthemum caucasicum* com. Mussin-Puschkin" among its synonyms. Unfortunately, this label is incomplete, without mention of the date of collection and locality. In the literature, this species has been reported repeatedly for Bulgaria [Velenowsky, *Fl. Bulg.* (1891) 272; Lipsky, *Fl. Kavk.* (1899) 348; Hayek op. cit. 204], which is extremely doubtful. I did not examine the material from Bulgaria. Probably, there are some close species morphologically resembling it in Bulgaria.

2. **T. subnivale** Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960) 490.—*Chamaemelum caucasicum* var. *pumilum* Boiss. Fl. or. III (1875) 331.—*C. melanolepis* An. Fedor. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 165, non Boiss.—*C. caucasicum* auct. fl. Cauc. non Willd.; Grossh. Fl. Kavk. IV, 128.

Perennial. Rhizome slender, woody, dark brown, usually branched, bearing nonflowering and 1–2 or few flowering shoots; stems 10–25 cm high, ascending, simple usually glabrous in middle, covered with scattered, short appressed hairs below and in upper part, particularly dense below capitulum, leafy up to apex, less often leafless in upper third. Leaves oblong, 15(25–40)35 mm long, 4(10–11)15 mm wide, pinnately cut into short thick segments, in turn thrice palmately cut, less often pinnate, cuspidate, sparsely pubescent, less often glabrous; basal leaves and those on nonflowering branches petiolate; cauline leaves smaller and sessile, broader at base, with simple linear segments. Capitula solitary, large, 30–45 mm in dia including ligulate ray florets; receptacle hemispherical. Involucre 15–20 mm in dia, hemispherical; involucre bracts oblong, obtuse, with wide (broader than middle green part of bract, especially at apex) blackish-brown membranous erose border. Peripheral ligulate florets 25–35; ligules white, 10(12–14)20 mm long, 3.0(4.0–5.0)5.5 mm wide, slightly narrowed at apex, obtuse, with 3 shallow teeth; tubular florets golden-yellow, with tube gradually broadening toward apex and deltoid or broadly deltoid, subobtuse

recurved lobes at full bloom, sometimes very dark brown at apex. Stigma deeply divided. Anthers with oblong-conical apical appendage. Achenes 2.0–2.5 mm long, 1.0–1.5 mm wide, compressed, with 3 thick whitish ribs on ventral side, light brown, smooth (immature), outside with 2 small, red, resin glands at apex; pappus membranous, 1.5–2.0 mm long, more than a half as long as achene (immature), three-lobed, with 3 equal lobes ventrally and flat, dark brown lobe of same length on dorsal side. Flowering July to September. (Plate V, Fig. 1.)

In alpine meadows, to 2,500–3,500 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern and Southern Transcaucasia. Described from Azerbaidzhan (Shakh-Dag Mountains). Type in Leningrad.

Note. *Tripleurospermum melanophyllum* (Nabel.) Pobed., described by Nabelek [*Publicat. de la Facul. des Sci. de Univ. Masaryk* (1925)17] from Kurdistan, is the closest species, which differs from the Caucasian species by the conical receptacle, smaller capitula, shape of the pappus and other minor characters. The ranges of both species are separate, which even more strongly confirms their independent status.

3. **T. grossheimii** (An. Fed.) Pobed. comb. nova.—*Chamaemelum grossheimii* An. Fed. in Bot. Zhurn., 34, 3 (1949) 290.—**lc.**: An. Fed. *ibid.*

Perennial. Rhizome woody, branched, brown; stems simple, erect or weakly ascending, 3.6–17 cm high, slender, longitudinally striate, glabrous or sparsely pubescent, leafy only in lower half. Leaves gradually reduced toward stem apex, oblong, pinnately cut, with linear-lanceolate segments, acute, 2-, 3- or 5-fid, glabrous or sparsely pubescent, especially at base; basal leaves 20–35 mm long, 6–10 mm wide, long-petiolate; cauline leaves with 2–3 pairs of linear segments, sessile, broader at base, amplexicaul, with linear simple segments. 166 Capitula 15–20 mm in dia, including ligulate florets; receptacle hemispherical. Outer involucre bracts narrow, triangular, middle and inner oblong, with blackish-brown, narrow membranous border. Ligules of peripheral ray florets oblong, broad, 8–10 mm long. 3.0–3.5 mm wide, with 3 obtuse, more or less large apical teeth, often recurved at flowering; disk florets yellow, with tube slightly swollen in upper part. Anthers with oblong-conical apical appendages. Achenes 2.5–3.0 mm long, 0.5–1.0 mm wide, with 3 thin ribs on ventral side, sometimes fourth very fine rib on outside, dorsally smooth, eglandular above or with 2 very small red glandular hairs; pappus large, a half as long as achene or slightly longer, three-lobed ventrally, middle lobe free almost from base, dorsally compressed, fimbriate, brown at apex. Flowering August.

In alpine meadows.—*Caucasus*: Possibly, growing in Southern Transcaucasia. Described from Great Ararat Mountain. Type in Leningrad.

4. **T. szowitzii** (DC.) Pobed. comb. nova.—*Pyrethrum caucasicum* β. *szowitzii* DC. Prodr. VI (1837) 56; Ldb. Fl. Ross. II, 548.—*Chamaemelum szowitsii* Boiss. Fl. or. III (1875) 332; Grossh. Fl. Kavk. IV, 128.

Perennial. Rhizome slender, woody, very dark brown, bearing few nonflowering and 1–2 flowering shoots; stems 15–30 cm high, erect, simple, unicapitulate, glabrous, leafy in lower half, upper half leafless or with strongly reduced leaves, more or less densely pubescent below capitulum. Leaves hard, thick; lower cauline leaves and those on nonflowering shoots oblong, 30–50 mm long, 15–20 mm wide, twice or thrice pinnately cut into narrow linear, more or less long cuspidate lobes; cauline leaves gradually reduced, all leaves sessile. Capitula large, 25–40 mm in dia including ligulate florets; receptacle hemispherical. Outer involucre bracts narrow triangular, weakly pubescent, especially along margin, inner obovate, oblong, obtuse, glabrous; all bracts green, narrowly brown-membranous along margin, with wide, brownish discontinuous border at apex. Peripheral ligulate florets 17–15 mm long, 5–7 mm wide, tubular, with gradually broadened tube. Anthers with oblong-triangular appendages. Achenes with long white pappus a third as long as achene, three-lobed ventrally, lobes connate to half, with short toothed border on dorsal side. Flowering May to July. (Plate V, Fig. 2.)

Humid meadows in alpine zone.—*Caucasus*: Eastern, Western, and Southern Transcaucasia. Described from Transcaucasia (Guriel). Type in Leningrad.

Note. In the original description of this species, the size of the pappus given is in error. De Candolle reported the pappus as short, which was repeated also by Boissier (Fl. or. III, 332), whereas, judging from the type material, the pappus of *T. szowitzii* is large, a third as long as the achene.

167 **Series 2. Transcaucasica** Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 345.—Stem with the branches shorter than or equal to it.

5. **T. transcausicum** (Manden.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 346.—*Chamaemelum transcausicum* Manden. in Zap. po Sist. i Geogr. Rast. Tibl. Bot. Inst. XXI (1959) 64.

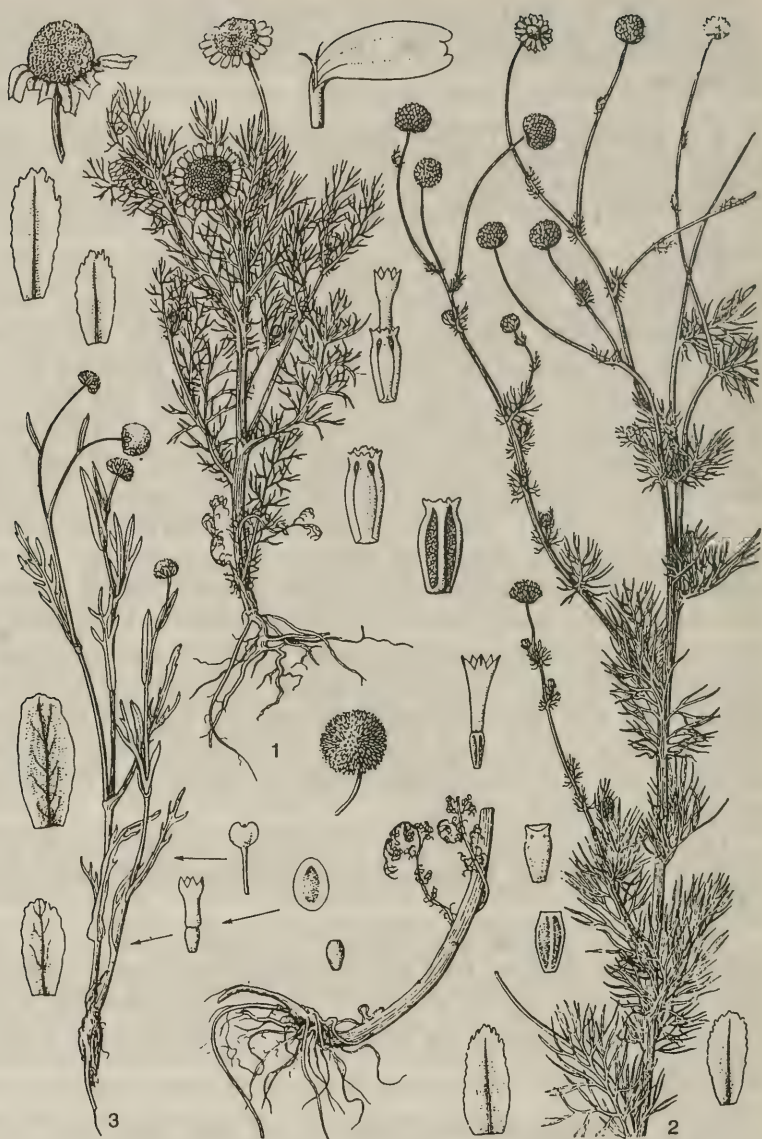


Plate VI.

1 — *Tripleurospermum limosum* (Maxim.) Pobed. habit of plant, involucre bracts, receptacle, peripheral pistillate floret, bisexual disk floret, achene in dorsal and ventral view; 2 — *T. disciforme* (C.A.M.) Sch. Bip., habit of the plant, involucre bracts, bisexual disk floret, achene in dorsal and ventral view; 3 — *Cotula coronopifolia* L., habit of plant, involucre bracts, receptacle, peripheral pistillate floret, bisexual disk floret, achenes of pistillate and bisexual disk florets.

Perennial. Rhizome woody, slender; stems 20–60 cm high, few, branched in upper half, branches slightly exceeding main stem, sparsely covered with long white hairs, more dense at nodes and below inflorescence, leafy throughout. Leaves on sterile shoots and basal leaves obovate-oblong, 30–85 mm long, 4–15 mm wide, twice pinnately cut into long linear cuspidate pinnules, with more or less long petioles, broader at base and with short pinnate secondary lobes, sparsely pubescent at base; cauline leaves distant, gradually reduced upward, sessile. Capitula 20–30 mm in dia including peripheral florets, on leafless peduncles, 20–50 mm long, ligules narrow-lanceolate, 12–15 mm long, 2–3 mm wide; receptacle hemispherical. Outer involucre bracts lanceolate, scatteredly pubescent, subobtusate; middle bracts oblong, obtuse, with narrow, brown, hairy border; inner bracts obovate, oblong, membranous at apex, with very dark brown border. Achenes 2 mm long, obpyramidal, very dark brown, rugulose and with small tubercles, glandular-hairy at apex on dorsal side, with narrow, acute, whitish ribs, middle rib on ventral side with deep depressions along sides; pappus white, short, a fourth as long as achene. Flowering June to August.

In high-mountain, wet meadows.—*Caucasus*: Eastern and Southern Transcaucasia. Described from Akhalkalaka. Type in Tbilisi.

Note. The specimens of this species collected from Tskhara-Tskharo Mountain by A.L. Pastukhov in 1911 and from Goderdz Pass by D.I. Litwinow in 1913 are noteworthy for the heavy pubescence of the leaves, stems, and outer involucre bracts.

6. ***T. karjaginii*** (Mand. and Sof.) Pobed. comb. nova.—*Chamaemelum karjaginii* Mand. and Sof. in Dokl. Akad. Nauk Azerb. SSR, XV, 3 (1959) 249.—*C. caucasicum* auct. cauc. non Willd.—*C. kotschyi* auct. cauc. non Boiss.

168 Perennial. Rhizome slender, branched, woody, brown; stems 1–3, 15–30 cm high, erect, with few short branches, not exceeding main stem, only in upper half, glabrous, pubescent below capitula, leafy up to apex. Lower leaves and those on nonflowering shoots ovate-oblong, 35–40 mm long, 8–18 mm wide, twice-pinnately cut into thin linear secondary lobes, simple pinnate at base and on petiole, with short segments, cauline leaves oblong, less divided gradually reduced upward; all leaves glabrous. Capitula solitary at apices of stem and branches, 3.0–3.5 cm in dia; receptacle hemispherical. Outer involucre bracts oblong-deltoid, middle oblong, inner obovate; all bracts with wide, almost blackish-membranous border. Outer ligulate florets 20, 12–15 mm long, 3–5 mm wide. Achenes unknown; pappus in tubular florets three-lobed, brown, like that of *T. caucasicum*. Flowering August.

On mountain slopes.—*Caucasus*: Southern Transcaucasia. Described from Armenia (Daralagyoz). Type in Tbilisi; isotype in Leningrad.

Note. A doubtful species, as the characters mentioned by the authors to distinguish it from *T. transcausicum* usually vary: broader leaves, shorter peduncles, broader and rich brown-bordered involucre bracts, broader ligules of ray florets, etc. There is an isotype preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, from which it is difficult to judge the stability of these characters.

Subgenus 2. Tripleurospermum.—*Leucoglossa* DC. sect. generis *Pyrethri* DC. Prodr. VI (1837) 53, p. max. p.—*Cynoclines* DC. sect. gen. *Pyrethri* DC. ibid. 58, p. min. p.—Achenes with short coronate pappus, less often pappus long, two-lobed. Capitula numerous; involucre bracts with more or less narrow light brown or wide white, lustrous, less often with blackish-brown margin. Stem usually branched. Annual herbs, rarely perennial, widely distributed along seacoasts, plains, often weeds, ruderals, rarely in mountains.

Type of subgenus: *T. inodorum* (L.) Sch. Bip.

Section 1. Phaeocephala Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1960) 346.—*Leucoglossa* sect. gen. *Pyrethri* DC. Prodr. VI (1837) 58, pro min. p. Achenes with short, coronate, entire or toothed pappus; involucre bracts with wide, membranous, very dark brown or blackish margin. Annual, less often biennial or perennial herbs.

7. T. ambiguum (Ldb.) Fr. and Sav. Enum. I (1875) 236 (tantum nomen, excl. pl. extrem.).—*Pyrethrum ambiguum* Ldb. Fl. Alt. IV (1833) 118; DC. Prodr. VI, 54; Ldb. Fl. Ross. II, 547.—*Matricaria ambigua* Kryl. Fl. Alt. III (1904) 625; O. and B. Fedtsch. Perech. Rast. Turk. IV, 185; Schischk. in Kryl. Fl. Zap. Sib. XI, 2737.—*Chamaemelum ambiguum* (Ldb.) Boiss. Diagn. Ser. I, XI (1849) 20.—**Exs.:** Pl. alt. exs. No. 87.

- 169 Perennial. Rhizome creeping, branched near apex, with few floriferous shoots and nonflowering branches; stems erect, 15–60 cm high, simple, sometimes weakly or more or less strongly branched near apex (Soviet Central Asian plants), sulcate, glabrous, sparsely pubescent above, especially below capitula, less often with long, curly, intertwined hairs. Leaves oblong-ob lanceolate, spatulate, or oblong, (3.0)3.5–4.0(10.0) cm long, (0.5)0.8–1.2(2.5) cm wide, twice pinnately cut into narrow filiform lobes, terminating in short cusp; basal leaves petiolate, cauline sessile, slightly broadened at base, gradually reduced upward.

Capitula solitary at apices of main stem and branches, less often in the fork of main stem, 3–5 cm in dia with peripheral ligulate florets; receptacle conical. Involucre flat-hemispherical; involucre bracts 2–3-seriate, outer lanceolate, subacute, inner oblong; all bracts with narrow, dark brown, undulate membranous border, broadened at apex, glabrous or sparsely hairy. Peripheral ligulate florets with horizontally divergent ligules, 8–9 mm long, 3–4 mm wide; disk florets golden yellow, often with red thickening at tips of lobes. Achenes 2 mm long, very dark brown, rugose-tuberculate, with 3 thick whitish ribs, sometimes also with 1–2 fine ribs dorsally, with 2 small, red, glandular hairs above on dorsal side; pappus membranous, slightly longer than in *T. tetragonospermum*, broadly crenate. Flowering April to September. (Plate VII, Fig. 1.)

In alpine and subalpine meadows, alpine tundra near patches of snow, high-mountain meadows and deciduous forests, at 2,000–3,500 m.—*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan (only in northern part). *General distribution*: Iran (northern part), Dzhungaria-Kashgaria, Mongolia. Described from Altai. Type in Leningrad.

Note. It has been reported that the plant collected in the Tien Shan in Mukhurdai Pass by Roborovsky had pink ligules of the ray florets; in other respects the plant is indistinguishable from *T. ambiguum*.

This high-mountain alpine species is still being confused with the Far Eastern coastal species *T. tetragonospermum* (F. Schun.) Pobed., from which it is well distinguished by a woody rhizome (and not an annual root), longer and narrower leaves, less leafy stems, a broader, dark brown (not narrow brownish) border of the involucre bracts, involucre bracts always with scattered pubescence along the margin (and not glabrous), unbranched or weakly branched (especially in alpine plants) stems, short-pubescent peduncles, especially on thickened part below the inflorescence where sometimes dense, curly, white hairs are found, a somewhat longer and bluntly broad-toothed pappus (and not entire). We have not included the Dauria Region in the distribution of this species, although a specimen of *T. ambiguum* from Baikal, collected by Maak as No. 20 and sent in 1858, is preserved in the herbarium of
 170 the Botanical Institute, Academy of Sciences of the USSR, which raises no doubt about the correctness of the identification. However, to-date this species has not been recollected from Lake Baikal. It must be noted that this species is also not found in the Sayans. The plants collected by B.K. Schischkin from the Kegen District of Kazakhstan in 1935 and earlier, in 1930, by P.A. Smirnov from the Naryn Range (village of Katon-Karagai), are distinguished by elongated leaves with short broad segments, pubescence throughout or only along the rachis,

large capitula, 4–5 cm in dia including ray florets, a broader membranous border of the involucre bracts, and a longer, membranous pappus.

8. **T. tetragonospermum** (F. Schm.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 346.—*Chamaemelum tetragonospermum* F. Schm. Fl. Sach. (1868) 148.—*Matricaria ambigua* auct. non Ldb. (cum *Pyrethrum ambiguum*): Miyaba Fl. Kuril. (1890) 242; Kom. in Tr. SPb. Bot. Sada, XXV (1907) 640; Kom. and Alis. Opred. Rast. Dal'nevost. Kr. II, 1028.—*Tripleurospermum ambiguum* Fr. and Sav. Enum. Pl. Jap. I (1875) 236.—*Matricaria tetragonosperma* (Fr. Schm.) Hara and Kitam. in Mem. Coll. Sci. Kyoto Imp. Univ. ser. B, 15 (Comp. Jap., 2) (1940) 336.—*Tripleurospermum inodorum* var. *ambiguum* Reich. ex Herder.—**lc.**: Iinuma Somoku Dzusesu, Iconograf. Pl. Nippon, XVII (1912) t. 20; Miyoshi Atlas Jap. Veget. t. 65.

Biennial or annual. Root vertical, curved, branched. Stems 7–50 cm high, more or less erect, thick, sulcate, glabrous, branched, especially above; branches long, ascending, densely leafy. Leaves oblanceolate-oblong or oblong, 7–11 cm long, 1.5–3 cm wide, twice or thrice pinnately cut into narrow filiform lobes, apical lobe 3–10 mm long, 0.3–0.6 mm wide, with short cusp, glabrous or sparsely pubescent; lower leaves sessile, middle cauline leaves short-petiolate; all leaves broadly amplexicaul; peduncles sulcate, thickened below capitula, often sparsely pubescent. Capitula few, at apices of main stem and branches, 3.5–4.0 cm in dia. Involucre flat-hemispherical; involucre bracts usually 4-seriate, imbricate; outer bracts ovate-oblong, obtuse, sometimes basally with somewhat long teeth, middle narrow-oblong, obtuse, inner lanceolate-oblong, obtuse; all bracts membranous, with prominent darker midrib on dorsal side, narrow light brown along margin. Receptacle spherical-conical, about 9 mm long. Peripheral ligulate florets 1-seriate, white, horizontal; ligules 15–18 mm long, 3.0–4.5 mm wide; disk florets golden yellow, with tube abruptly broadened at apex. Anthers basally obtuse, filaments thickened at apex. Achenes 2–3 mm long, with 3 or 4 ribs, rugose-tuberculate, with 2 roundish
171 oleiferous glandular hairs above on convex dorsal side; pappus membranous, short, more or less entire. Flowering June to October.

Along seacoasts.—*Far East*: Kamchatka (rarely), Anadyr (very rarely), Ussuri, Sakhalin, Kuril Islands. *General distribution*: Japan, China. Described from Sakhalin. Type in Leningrad.

Note. This species is found mainly on the islands of the Pacific Ocean; on the mainland, it usually is in the Pacific Coastal Region. Three plants collected from Kamchatka and one from the Penzha Inlet

apparently were introduced there by chance, since this species is completely absent from the Okhotsk coast of the continent.

9. **T. phaeocephalum** (Rupr.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk, XXI (1961) 347.—*Chrysanthemum grandiflorum* Hook. in Parry's Sec. Voy. (1825) 398, non Brouss. (1804).—*Pyrethrum inodorum* var. *nanum* Hook. Fl. Bor. Am. 1 (1833) 320.—*Matricaria inodora* var. *nana* Ldb. Fl. Ross. II, 2 (1844) 547.—*M. inodora* θ . *monocephalum* Sch. Bip. Ueb. die Tanac. (1844) 30.—*M. inodora* f. *phaeocephala* Rupr. Fl. Samojed. (1845) 42.—*M. grandiflora* Brit. in Mem. of the Torrey Bot. Club. 5 (1893–1894) 340; Tolm. in Tr. Polyarn. Kom., 13, 43; Perfil'ev, Flora Severnogo Kraya, 3, 352.—*M. phaeocephala* (Rupr.) Stefansson Fl. Isl. ed. 2 (1924) 223.

Perennial or biennial. Root short, thick with numerous fibrous rootlets. Stems 1–few, 2–3 from root, up to 30 cm high, erect, simple or weakly branched near apex, sulcate, glabrous. Leaves sparsely covering stem, oblong, (3.0)3.5–4.0(9.0) cm long, (0.8)1.0–2.0(3.0) cm wide, usually glabrous, simple pinnate with 2–3-lobed flat lobes, 0.2–1.5 mm wide, gradually narrowed toward apex, rachis flat, 1.5–2.0 mm wide. Peduncle thickened below capitula, glabrous; capitula solitary at stem apex or, few in case of branching, large, 3–6 cm in dia. Involucre hemispherical, 2–3-seriate; involucre bracts with triangular green part and wide border, broader than green part of bract, especially at apex, blackish-brown, undulate, entire or discontinuous. Receptacle hemispherical, slightly elongated. Ligulate florets 12–20 mm long, 3–5 mm wide, white, 3-toothed; disk florets with wide short tube, slightly broader at apex, golden-yellow, opened florets sometimes with anther tube exerted from florets. Achenes 1–2–3 mm long, with more or less white, thick, obtuse ribs, light brown, sometimes almost white, weakly rugose outside, with 2 fairly large, red, oleiferous glandular hairs; pappus white, membranous, 0.5 mm long, 4–5-lobed, usually horizontally spreading. Flowering June to August.

Along Arctic coasts, sometimes as weed.—*Arctic*: Arctic Europe, Novaya Zemlya, Arctic Siberia, Chukotka, Anadyr; *European part*: 172 Karelia-Lapland (only northern part). *General distribution*: Arctic North America. Described from the Kolguev Island. Type in Leningrad.

Note. In European specimens of this species a highly prominent anther tube can be seen in some tubular florets during full bloom in almost all capitula; in American specimens, the anthers are hardly visible or only a third exerted; the pappus in American plants is slightly shorter than in European plants. Siberian specimens of this species differ from American and European specimens by having brown (and not almost black) involucre bracts with a lighter-colored margin.

These characters are hardly of taxonomic importance, as they are extremely variable.

10. **T. subpolare** Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 347.—*Matricaria ambigua* auct. non Ldb. (cum *Pyrethro ambiguo*).—*M. grandiflora* auct. non Britt.: Perf. Fl. Sev. Kraja 3 (1936) 352.—**!c.**: Bot. Mat., XXI (1961) 348.

Annual or biennial. Root short, branched. Stems few, 25–50 cm high, erect or ascending, branched only in upper half, weakly sulcate, glabrous, usually reddish-violet, sometimes basally dark violet. Leaves dense, obovate, (4.0)4.5–7.0(10.0) cm long, (1.0)1.5–2.5(3.5) cm wide, glabrous, twice or thrice pinnate, particularly strongly divided in upper part into narrow filiform lobes; rachis slightly thickened and cristate at base. Peduncle 1.5–6.0 cm long, thickened below capitula, glabrous. Capitula more or less in corymbs, at apices of main stem and branches, sometimes horizontal, 3–5 cm in dia. Involucre hemispherical, 2–3-seriate; outer involucral bracts with dark brown, almost black border below, narrower than green part of bract, with very wide, brown or light brown, entire or discontinuous border at apex; green part of bracts oblong, with almost parallel margin or sometimes narrowed more or less in middle. Receptacle hemispherical. Ligulate florets 10–18 mm long, 3–5 mm wide, white, 3–4-toothed; disk florets bright yellow, with broad tube, gradually broadening upward, lobes usually with longitudinal reddish veins at tips. Anther tube exserted; anthers roundish at base, apically obtuse, with short pointed appendages. Achenes 2–3 mm long, with light colored or brown obtuse ribs, rugose outside, with 2 small roundish, red, oleiferous glandular hairs; pappus white, membranous, 4–5-lobed, more than 0.25 mm long.

Along seacoasts and ruderal places.—*European part*: Karelia-Lapland. Endemic. Described from the Solovetsky Islands (B. Zayatsky). Type in Leningrad.

Section 2. Chlorocephala Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXXI (1961) 349.—Sect. *Leucoglossa* DC. Prodr. VI (1837) 53, p. min. p.; Ldb. Fl. Ross. II (1844) 547, p. min. p.—Involucral bracts green, with narrow, white or brown membranous margin; capitula small, 1–3 cm in dia; pappus short, with weakly lobed. Perennial herbs, with leaves in lower half of stem.

Type of section: *T. elongatum* (F. and M.) Bornm.

11. **T. elongatum** (F. and M.) Bornm. in Fedde, Repert, Beih. XXXIX (1944) 337.—*Pyrethrum elongatum* F. and M. ex DC. Prodr. VI (1837) 56.—*Matricaria heterocarpa* C. Koch in Linnaea, XXIV

(1851) 333.—*Chamaemelum elongatum* Boiss. Diagn. ser. I, 11 (1849) 20.—*C. heterocarpum* Boiss. Fl. or. III (1875) 329.

Perennial. Rhizome slender, woody; stems numerous, 30–40 cm high, branched, leafless above. Leaves oblong, thrice pinnatisect in linear, filiform, acute, entire lobes. Capitula solitary at apices of stems and branches, 1.5–2.0 cm in dia; receptacle hemispherical. Involucral bracts obovate-oblong, with narrow, white or slightly brownish membranous border, obtuse, glabrous. Ligulate florets white, 10–15 mm long, 2–3 mm wide, 3-toothed, at apex; tubular florets infundibuliform, with broad triangular lobes. Anther appendages conical, small. Stigma deeply divided. Achene 2 mm long, 1 mm wide, dark brown, rugose outside, with 2 oleiferous glandular hairs at apex, and 3 thick white ribs on ventral side; pappus white, membranous, longer on ventral side, 1/3 as long as mature achene. Flowering May. (Plate V, Fig. 3.)

Stony places.—*Caucasus*: Eastern and Western Transcaucasia. Described from Kartalinia (region between Tbilisi and Kutaisi). Type in Leningrad.

12. **T. rupestre** (Somm. and Lev.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 350.—*Chamaemelum rupestre* Somm. and Lev. in Nuov. Giorn. Bot. Ital. ser. II, 2 (1895) 86; Grossh. Opred. 458.

Perennial. Rhizome slender, woody, dark brown, with short, densely leafy vegetative branches; stem 30 cm high, branched from base, arcuately ascending, blackish-violet, elongate, with solitary capitula, glabrous. Leaves of nonflowering branches and basal leaves 8–9 cm long, 9 cm wide, on 5 cm long petioles, basally toothed, with one larger tooth; all leaves ovate-oblong, once or twice-pinnately cut into narrow linear lobes (apical lobes shorter), cuspidate; cauline leaves much smaller, less divided, sessile. Capitula small, 1 cm in dia, with white peripheral florets; receptacle hemispherical. Involucre almost glabrous; outer involucral bracts triangular, brown, inner oblong, membranous along margin, obtuse, weakly emarginate. Ligules of peripheral florets elliptical, 5–6 mm long, almost as long as involucre. Achenes 2.0–2.5 mm long, oblong, compressed, smooth, with 3 thick
174 ribs on ventral side, dorsally lacking ribs; pappus 1/3 as long as achene. Flowering July to August.

On rocks.—*Caucasus*: Western and Southern Transcaucasia. Described from Lower Adzharia (Shvakhevi). Type in Florence.

13. **T. colchicum** (Mand.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 350.—*Chamaemelum colchicum* Mand.

in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 377.—*C. tchihatchevii* auct. cauc. non Boiss.: Grossh. Oprod. 458.—Ic.: Fl. Gruzii, VIII, 345.

Perennial. Rhizome slender, branched, woody, dark brown, with nonflowering and few flowering shoots; stems 20–30 cm high, leafless or leafy only in upper half, sulcate, sparsely hairy, more or less densely below capitula. Basal leaves and those on nonflowering shoots ovate, 30–40 cm long, 10–15 mm wide, pinnatisect, with segments palmately or pinnately divided into lanceolate, short, broad lobes, appressed-hairy, long-petiolate; cauline leaves small, reduced upward along stem, oblong, pinnate, with simple linear lobes, sparsely pubescent, sessile. Capitula solitary on stems, 1.5–2.5 cm in dia; receptacle hemispherical. Outer involucre bracts narrow-triangular, inner oblong or obovate; all bracts light green, narrow, light-brown along margin, glabrous. Peripheral ligulate florets 10–15 mm long, 3–4 mm wide, abruptly narrowed toward base, with 3 small teeth at apex; tubular disk florets with wide tube. Achenes 2 mm long, slightly rugose, with broad ribs on ventral side, and narrow depression inbetween; corona white, trilobed ventrally, lobes connate up to half, dorsally with more or less short dentate border. Flowering June to July.

In passes, on rocks along riverbanks.—*Caucasus*: Western Transcaucasia. Endemic. Described from the Klukhorsk District (Nakharsk Pass). Type in Tbilisi.

14. **T. tchichatchevii** (Boiss.) Bornm. in Fedde, Beih. LXXXIX (1944) 336.—*Chamaemelum tchihatchewii* Boiss. in Tchih. As. Min. 2 (1860) 256; Boiss. Fl. or. III, 332.—*Matricaria tchihatchewii* (Boiss.) Voss. in Vilmorin's Bumeng. ed. 3, Sib. et Voss. (1896) 504; Hand.-Mazz. in Ann. Nat. Hofmus. Wien 23, 194.—*Pyrethrum tchichatcheffii* Hort. W. Robinson, Engl. Fl. Gard. (1883) t. 213.

Perennial. Rhizome slender, brown, woody; stems few, 15 cm high, simple, ascending, leafy in lower half, sparsely pubescent, leafless and glabrous in upper half, tetraquetrous, slender. Leaves ovate-oblong, 20–30 mm long, 10–12 mm wide; lower leaves twice pinnately cut into short, narrow, cuspidate lobes, petiolate; upper leaves simple, pinnate, sessile; all leaves canescent. Capitula 2–3 cm in dia; receptacle hemispherical. Involucre bracts oblong-linear, obtuse, with very narrow, pale, membranous border, weakly and sparsely pubescent. Ligules of peripheral florets elliptical-oblong, subobtus, 3-toothed. Achenes black, slightly curved, dorsally not punctate, slightly rugose, with coronate pappus, slightly lobed and white, a half as long as achene. Flowering May to July.

On forested seaside hills, dry stony slopes, and open woodlands.—Possibly, growing in Western Transcaucasia. *General distribution*: Balkans-Asia Minor. Described from Samsun (in the Pontic Province of Asia Minor). Type in Paris?

Section 3. Tripleurospermum.—Sect. *Rhytidospermum* Sch. Bip. Ueb. die Tanacet. (1844) 32.—Sect. *Chamomilla* gen. *Matricariae* DC. Prodr. VI (1837) 51, pro min. p.—Achenes granulose-rugose; pappus short, coronate, entire, finely toothed. Peripheral florets with more or less long ligules; anther appendages ovoid-triangular. Annual herbs, with twice or thrice pinnate leaves.

Type of section: *T. inodorum* (L.) Sch. Bip.

Series Inodora 1. Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 351.—Involucral bracts with narrow, white or light brown border.

15. **T. inodorum** (L.) Sch. Bip. Ueb. die Tanacet. (1844) 32; Lindemann, Prodr. Fl. Chersonen, 106; C. Koch Syn. 1026.—*Matricaria inodora* L. Fl. Suec. ed. II (1755) 765; DC. Prodr. VI, 52; Ldb. Fl. Ross. II, 545; Kryl. Fl. Zap. Sib. XI, 2735.—*M. chamomilla* L. Sp. pl. (1753) 891.—*Chrysanthemum inodorum* L. Sp. pl. (1763) 1253; Schmalh. Fl. II, 68.—*Chamomilla inodora* Gilib. Exerc. phytol. I (1792) 179.—*Pyrethrum inodorum* Moench, Meth. (1794) 597.—*P. parviflorum* Willd. Sp. pl. III, 3 (1803) 2158.—*Rhytidospermum inodorum* Sch. Bip. II, Canar. III, 2 (1836) 277.—*Chamomilla inodora* C. Koch in Linnaea, XVII (1843) 45; Ej. Syn. 45.—*Chamaemelum inodorum* (L.) Vis. Fl. Dalm. II (1847) 85; Boiss. Fl. or. III, 327; Grossh. Fl. Kavk. IV, 127.—**Ic.**: Fedtsch. and Fler. Fl. Evrop. Ross. Fig. 971; Syreistsch. III. Fl. Mosk. Gub. III, 270; Hegi III. Fl. VI, 2, fig. 303 and 304.—**Exs.**: GRF No. 824; Fl. exs. Aust.-Hung. No. 3789; Fl. Gall. et Germ. exs. No. 2864; Pl. Finl. exs. No. 978 p. p.

Annual or biennial. Root slender, fusiform. Stem erect or ascending, 30–75 cm high, cylindrical, fistular, with numerous light colored and green furrows, glabrous, usually branched in upper half. Leaves ovate-oblong or oblong, thrice pinnately cut into narrow filiform long lobes, of which apical lobe 4–10 mm long and 0.25–1.0 mm wide, with short cusp, glabrous, sessile or on usually short petioles thickened at base; peduncles long, uncapitulate, thickened below capitula, sometimes weakly pubescent. Capitula few or numerous, at apices of main stem and branches, 1.5–4.0 cm in dia. Involucral bracts oblong or oblanceolate, slightly broader at base, more or less narrow-membranous along margin, white or light brown; outer bracts sometimes lanceolate,

pale green, without membranous margin. Receptacle hemispherical or broadly conical, glabrous, weakly punctate. Peripheral florets ligulate, white, horizontal, ligules 50–20 mm long; disk florets golden-yellow, tube gradually broadening in upper half, often (especially in southern form) lobes with bright red glandular hairs at apex. Achenes 2.0–2.5 mm long, dark-brown, flattened, rugose, with 3 white narrow ribs ventrally and along sides and with 2 large, roundish, oleiferous, red glandular hairs above on convex dorsal side; pappus short, coriaceous, almost entire. Flowering June to September.

In fields, meadows, cultivated lands, along irrigation channels, roadsides, riverbanks, on saline land and mountain slopes.—*European part*: Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga Region, Lower Volga, Upper Dniester, Bessarabia, Black Sea Region, Lower Don, *Caucasus*: Ciscaucasia, Dagestan, Eastern Transcaucasia; *Western Siberia*: Upper Tobol, Irtysh; *Far East*: Ussuri (introduced); *Soviet Central Asia*: Aralo-Caspian Region (rarely), Lake Balkhash Region, Syr-Darya. *General distribution*: Central Europe, Atlantic Europe, Balkans-Asia Minor. Described from Sweden. Type in London.

Note. M.I. Nazarov found a hybrid in the herbarium between *T. inodorum* and *Matricaria chamomilla* L., which was morphologically similar to the latter species but had achenes like those of *T. inodorum*. However, the presence of 4, sometimes 5, ribs on the achene is a character typical of *Matricaria chamomilla* L.

Schultz-Bipontin (Sch. Bip. *Ueber die Tanacet.* 1844, 33) reports a hybrid between *T. inodorum* and *Anthemis tinctoria* L., which was described as a separate species—*Anthemis hybrida* Hampe.

The two specimens of this species from Central Asia preserved in the herbarium of the Botanical Institute, 1) from the village of Ulutavskoe (vicinity of Kzyl-Orda, collected by S.Yu. Lipschitz on July 14, 1929, No. 436; and 2) from the village of Mugan (near the village of Petropavlovka, Turgai Region, April, 1905), differ from typical *T. inodorum* by having strong stem pubescence, especially below the capitula. Besides, the first specimen also has pubescent leaves.

The plants of this species in the Trans-Volga Region and Lower Volga on saline soils and along mountain slopes of the Caucasus differ by having smaller capitula with shorter ligules, sometimes decurved at flowering, a conical receptacle (not always persistent), outer involucre bracts always narrowly lanceolate, pale green and with reddish veins present at the apices of the lobes of the disk florets. However, all these characters are also found in isolated cases in typical specimens of *T. inodorum*.

- 177 16. **T. maritimum** (L.) Koch. Syn. ed. II, p. 3 (1845) 1016.—*T. inodorum maritimum* Sch. Bip. Ueb. die Tanacet. (1844) 33.—*Chamaemelum maritimum* Boiss. Diagn. ser. I, XI (1849) 21; Willk. in Bot. Zeitschr. 33, 22 Jahrg. (1846) 249.—*Matricaria maritima* L. Sp. pl. (1753) 891; Georgi Besch. d. Russ. Reich. IV, III, 1252; Lucé, Fl. Osil, 282.—*Matricaria inodora* β . *maritima* Wahlenb. Fl. Suec. (1826) 533; Ldb. Fl. Ross. II, 2, 546.—*Chamaemelum inodorum* var. β . *maritima* Vis. Fl. Dalmat. II (1847) 85.—*Chrysanthemum inodorum* L. Sp. pl. (1763) 1253.—*Pyrethrum maritimum* Smith, Fl. Brit. II (1800) 901; DC. Prodr. VI, 53.—*Matricaria inodora** *maritima* Lindem. Bild. ur Nordens Fl. III (1926) tabl. 535 B.—**lc.**: Lindem. l.c.—**Exs.**: Fl. Gall et Germ. exs. de C. Billot No. 1503.

Annual or biennial. Root branched below in numerous slender fibrous roots. Stems solitary, 10–15–40 cm high, branched from base or only above, glabrous, reddish, especially at base, leafy up to tip. Leaves oblong or obovate, (2.5)3.0–5.0(9.0) cm long, (0.8)1.0–2.0(2.5) cm wide, thrice pinnately cut into short succulent lobes, acute or subobtus, glabrous; lower leaves petiolate, middle and upper sessile. Capitula 2.5–3.5 cm in dia; receptacle hemispherical. Outer involucre bracts lanceolate, acute; inner narrow-oblong, obtuse; all bracts green, with very narrow, light brown, membranous border. Peripheral ligulate florets with more or less broad, short ligules. Mature achenes dark brown, 1.5–2.0 mm long, 0.8–1.0 mm wide, with 3 light brown, thick, obtuse ribs, of which central occupying almost entire ventral side, dorsally rugose, with 2 red oleiferous glandular hairs above; pappus with 2 lobes on each side of achene and short border on dorsal and ventral sides. Flowering July to September.

Along sandy seacoasts.—Ladoga-Ilmen (introduced). *General distribution*: Scandinavia, Atlantic Europe. Described from seacoasts of Northern Europe. Type in London.

Note. I am citing this West European coastal species, reported from Leningrad city, as introduced. Earlier, when the seacoasts were not as developed, this species could have grown more widely along seacoasts.

Schmalhauzen (*Fl.* II, 68) reported the species from the Baltic Sea area (Finland, Estonian SSR—Tallin).

17. **T. limosum** (Maxim.) Pobed. comb. nova.—*Chamaemelum limosum* Maxim. Prim. Fl. Amur. (1859) 156.—*T. inodorum* β . *limosum* Rgl. ex Herder in Bull. Soc. Nat. Mosc. XL (1867) 43.—*Matricaria limosa* (Maxim.) Kudo in Contr. Know. Fl. North Saghal. (1923) 58, exsl. specim.—*Matricaria inodora* auct. non L.: Forbes and Hemsl. in Journ. Linn. Soc. XXIII (1888) 439; Kom. Fl. Man'chzh. III, 639.—

- 178 *Matricaria maritima* ssp. *limosa* (Maxim.) Kitamura, Compos. Japon. II (1940) 335.

Annual or biennial. Root short, fibrous. Stems erect, 8–35 cm high, simple or strongly branched from base, branches appressed to stem, upward spreading, erect, long, near apex branched again, sulcate, glabrous, densely leafy. Basal leaves withering after anthesis; middle cauline leaves oblong, 5.5–9.5 cm long and 2.5–2.7 cm wide, thrice-pinnate, with narrow, filiform, obtuse lobes, 0.5 mm wide, glabrous on both sides, simple pinnate at base, amplexicaul; upper leaves strongly reduced. Peduncles 1.5–3.0 cm long, below capitulum glabrous, thickened and often pubescent. Capitula numerous, solitary at apices of main stem and branches, 10–15 mm in dia. Involucre hemispherical, 3-seriate; bracts more or less equal, outer linear-lanceolate, inner oblong, obtuse, with single brownish green stripe on light green or whitish dorsal surface, and broad (sometimes broader than middle greenish part), white, lustrous or slightly brownish, membranous border. Receptacle broadly ovoid-conical. Peripheral florets with short broad ligules, 4.5 mm long, 1.5–2.0 mm wide, less often 8–10 mm long and 1.5–2.0 mm wide; disk florets bright yellow, with reddish veins at tips of lobes. Anther tube sometimes strongly exerted; anthers basally obtuse, with oblong apical appendages. Achenes with 3 whitish broad ribs, narrow, 2 mm long, 1 mm wide, dorsally brown, rugose, with 2 large, red, oleiferous glandular hairs at apex; pappus lobed, membranous, 0.6 mm long. Flowering June to August (Plate VI, Fig. 1.)

Along open sunny banks of rivers and lakes in marshes.—*Far East*: Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Japan, China. Described from the vicinity of Nikolaevsk-on-Amur. Type in Leningrad.

18. ***T. breviradiatum*** (Ldb.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 352.—*Pyrethrum breviradiatum* Ldb. in Mém. de l'Acad. des sc. Pétersb. V (1815) 577.—*Matricaria inodora* ε. *breviradiata* Ldb. Fl. Ross. II (1844) 547.

Annual. Stem 40 cm high, branching only in upper half. Capitula 18 mm in dia; peripheral ligulate florets almost a half as long as disk, sometimes absent; receptacle more or less hemispherical. In other respects it does not differ from the previous species.

- 181 *Eastern Siberia*: Lena-Kolyma. Endemic. Described from lower reaches of the Kolyma River. Type in Leningrad.

Note. Besides the type specimens of Ledebour, there are no other specimens of this species in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR, Leningrad. It has not been collected since Ledebour's time. Its status as a separate species is doubtful.

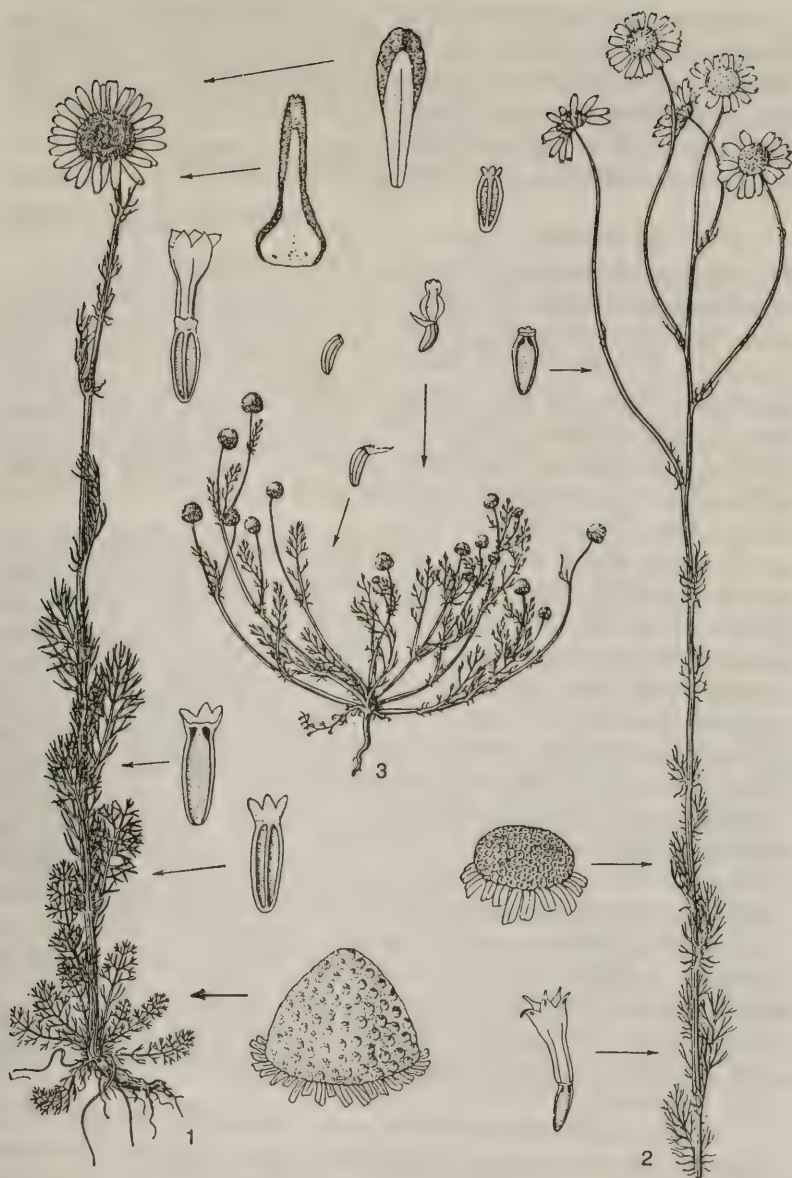


Plate VII.

1—*Tripleurospermum ambiguum* (Ldb.) Fr. and Sav., habit of plant; involucre bracts, bisexual floret, dorsal and ventral view of achene; 2—*T. sevanense* (Mand.) Pobed., habit of plant, receptacle, bisexual floret, dorsal and ventral view of achene; 3—*Matricaria aurea* (L.) Boiss., habit of plant, bisexual floret, and achene with and without pappus.

Section 4. *Leiospermum* Sch. Bip. Ueb. die Tanacet. (1844) 33.—*Pseudo-chamomilla* DC. Prodr. VI (1837) 51, p. p.; Ldb. Fl. Ross. II, 544 p. p.—Achenes smooth; pappus absent or scarcely visible along margin; peripheral florets not ligulate or short-ligulate, with short style; disk florets five-toothed. Annual herbs.

Type of section: *T. disciforme* (C.A.M.) Sch. Bip.

19. ***T. disciforme*** (C.A.M.) Sch. Bip. Ueb. die Tanacet. (1844) 34.—*Chrysanthemum disciforme* C.A.M. Verzeichn. (1831) 75.—*Matricaria disciformis* DC. Prodr. VI (1837) 51; Ldb. Fl. Ross. II, 544.—*M. corymbifera* DC. Prodr. VII (1838) 297.—*Chamaemelum disciforme* (C.A.M.) Vis. Fl. Dalmat. II (1847) 85; Boiss. Diagn. I, 11, 21; Boiss. Fl. or. III, 328; Grossh. Fl. Kavk. IV, 127.—*Matricaria sive, C. nanocephalum* Rupr. in Bull. Phys.—Math. Ac. Sci. Pétersb. XXIV (1856) 231.—*C. disciforme* β . *quadrilobum* Boiss. Fl. or. III (1875) 328.—*C. disciforme* f. *radiata* Sosn. ex Grossh.; Fl. Kavk. IV, 127.—**Exs.:** Pl. or. exs. No. 298.

Biennial. Plants glabrous; stem erect, 40–100 cm high, sulcate-striate, branched near apex. Leaves oblong, twice or thrice pinnate. (3.0)4.5–6.0(17.0) cm long, (0.8)1.5–2.0(3.5) cm wide, with narrow linear segments; lower leaves petiolate, middle and upper sessile, broadened at base; upper leaves strongly reduced. Inflorescence corymbose at apices of stem and branches, with 3–4 capitula on 3.5–10.0 cm long leafless peduncles; capitula 8–12 mm in dia; involucre bracts obtuse, with wide, white, membranous, lustrous border; receptacle hemispherical. Capitula usually with only tubular disk florets, latter 5-toothed, 3.0–3.5 mm long, with oblong, 2.0–2.5 mm-long tube and short 0.25–0.5 mm long lobes, red, resinous, glandular hair at tip of each lobe, less often capitula also with short peripheral ligulate florets shorter than involucre. Anthers narrow, oblong, with deltoid apical appendages slightly exserted from throat of floret. Stigma branches exserted from anther tube. Achenes smooth, 1.25–1.5 mm long, 0.25–0.5 mm wide, with 3 narrow white ribs on ventral side in upper border part, 2 red oleiferous glandular hairs at apex on dorsal side. Flowering May to September. (Plate VI, Fig. 2.)

In wet mixed herb meadows along riverbanks, ravines, in dry riverbeds, and as weed in cultivated fields and by roadsides—**Caucasus:** Talysh, Southern Transcaucasia; **Soviet Central Asia:** Kyzyl-Kum (southeastern), Pamiro-Alai Region, Tien Shan, mountainous Turkmenia. **General distribution:** Armenia-Kurdistan, Iran. Described from Talysh. Type in Leningrad.

182 **Note.** The involucre bracts in this species vary in shape and width of the membranous border; the outer bracts are sometimes entirely

without the membranous border and with an acute tip. Frequently, ligulate ray florets with short (shorter than the involucre) white ligules occur with tubular florets in the capitula, but in all other characters they are indistinguishable from the typical plants. From the Zeravshan Valley (Oal Ravine). O. Fedtschenko collected *T. disciforme* with achenes having a quite long, scaly, lobed, pappus, but smooth and not rugose as in *T. decipiens*.

20. ***T. decipiens*** (Fisch. and Mey.) Bornm. in Fedde, Repert, XLIX (1940) 240.—*Pyrethrum decipiens* Fisch. and Mey. Ind. Sem. Hort. Petrop. II (1835) 48.—*Chamaemelum decipiens* (Fisch. and Mey.) Boiss. Fl. or. III (1875) 328.

Annual or biennial. Stems erect, 40–100 cm high, cylindrical, sulcate, glabrous, branched above. Leaves larger in lower part of stem, oblong, 6–9 cm long, 0.8–2.0 cm wide, twice or thrice ternate, with short cuspidate segments, broadened toward base, once or twice pinnate; leaves in upper part of stem gradually reduced, sessile. Inflorescence corymbose, compound, with numerous capitula on 5–15 cm long leafless peduncles, thickened below capitula. Capitula 7–10 mm in dia; involucre bracts obtuse, with wide, white, membranous border; receptacle hemispherical; capitula with only tubular florets. Anthers narrow, oblong, with deltoid apical appendages, slightly exserted. Stigma branches exserted from anther tube. Achenes rugose, with 3 white ribs on ventral side and 2 red oleiferous glandular hairs at apex on dorsal side; pappus membranous, lobed, very short. Flowering June.

In wet alpine and subalpine meadows, and cultivated fields.—*General distribution*: Northern Iran, Asia Minor. Described from northern Iran (Hoi). Type in Leningrad.

Note. This species has not yet been collected in the USSR, but is found close to its border in northern Iran. Possibly it has been overlooked in the Caucasus, as it is quite similar to *T. disciforme*. However, the species are so different in the structure of their achenes that they cannot be confused. Besides in the achenes, *T. decipiens* differs from *T. disciforme* by having a longer receptacle and often a more compound corymb.

21. ***T. sevanense*** (Mand.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1960) 353.—*Chamaemelum sevanense* Mand. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 376.—*C. trichophyllum* auct. cauc. non Boiss.; Grossh. Fl. Kavk. IV, 128.

Annual. Plants glabrous; stems erect, 30–45 cm high; sulcate-striate, branched from base or only above. Leaves oblong; lower leaves 4.0–
183 4.5 cm long, 0.8–10.0 cm wide, long-petiolate, basally broadened and

with short, segments, twice or thrice pinnate, with filiform thin cuspidate segments, gradually reduced upward. Capitula few, solitary, on 4–10 cm long peduncles, 1–2 cm in dia, with ligulate florets. Involucral bracts few; outer bracts ovate, obtuse, pale green, with narrow pale brown border, inner bracts obovate, very broadly, especially at apex, white-membranous. Outer florets with 3-toothed white ligules; tubular disk florets with orange glandular hairs at tips of lobes. Achenes 1.5 mm long, 0.5 mm wide, broadened at apex, smooth, with thin filiform ribs, large, red, oleiferous glandular hairs, pappus white, membranous, lobes less than a fourth as long as achene. Flowering July. (Plate VII, Fig. 2.)

In ravines, wet meadows.—*Caucasus*: Southern Transcaucasia. Described from Armenia (near Bavadyan-Dar). Type in Tbilisi; isotype in Leningrad.

Note. It differs from *T. disciforme* by having outer involucral bracts with a narrow pale brown border, ray florets present in the capitulum with long white ligules that are twice as long as the involucre, and achenes, with two large, red, oleiferous glandular hairs on the dorsal side, and a white-membranous, lobed, short pappus. It also differs from *T. decipiens*, by having smooth and not rugose achene.

Section 5. *Gastrosulum*.—Sect. *Eugastrosulum* (Sch. Bip.) Pobed.—*Eugastrosulum* in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 354.—Sect. *Eugastrosulum* generis *Gastrosuli* Sch. Bip. Ueb. die Tanacet. (1844) 29.—Achenes with two white lateral ribs and a third suberous, triangular rib, more prominent ventrally, separated from lateral ribs by narrow furrows; achenes dorsally brown, with glandular hairs at apex; pappus membranous, bilobed, long, almost half as long as a achene, dorsally longer.

Type of section: *Tripleurospermum parviflorum* (Willd.) Pobed.

22. ***T. parviflorum*** (Willd.) Pobed. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 354.—*T. praecox* (MB.) Bornm. in Beich. Bot. Centralbl. LX (1940) 192.—*Pyrethrum parviflorum* Willd. Sp. pl. III, 3, (1804) 2158.—*P. procox* M.B. Fl. taur.-cauc. II (1808) 324.—*Gastrosulum praecox* Sch. Bip. Ueb. die Tanacet. (1844) 29.—*Matricaria inodora* γ. *praecox* Ldb. Fl. Ross. II (1844) 546.—*M. praecox* DC. Prodr. VI (1837) 52.—*Chamomilla praecox* C. Koch in Linnaea, XVII (1843) 45.—*Chrysanthemum monspeliense* Georgi, Beschr. d. Russ. R. IV, 3 (1800) 1251?—*Chamaemelum praecox* Vis. in Journ. Bot. Ital. 2 (1844) 34; Boiss, Fl. or. III (1875) 326; Stapf. Erg. Polak. exp. (1885) 58; Grossh. Fl. Kavk. IV, 127.—**lc.**: Fl. Turkm. VII, 97.

Annual. Stems solitary or few, simple or weakly branched, 10–30 cm high, sulcate, weakly pubescent, especially below capitula. Leaves 184 oblong, 3–5 cm long, 0.5–1.0 cm wide; basal and lower cauline leaves bipinnate, long-petiolate; upper cauline leaves smaller, pinnate, sessile; all leaves deeply divided into linear, long, subulate segments; rachis broadened at base, and with pinnate, short, distant segments. Capitula solitary on leafless peduncles, 3–10 cm long, weakly pubescent, slightly thickened below capitula; receptacle conical, acute or obtuse, elongate, less often almost hemispherical, punctate. Outer involucre bracts oblong, inner obovate, wide; all bracts 2–3 mm long, more or less broadly white- or light brown-membranous along margin. Florets in capitulum heterogamous; peripheral florets pistillate, with white, short, broad ligules, 3–6 mm long, 2–3 mm wide, apically bifid, or 3-toothed, with short middle tooth; tubular disk florets lemon-yellow, 1.5–3.0 mm long, with 5 broadly deltoid lobes. Anthers with very minute, 0.25 mm long, narrow-triangular appendage, exserted. Style branches with red stripe in center and yellow border at ends. Achenes on maturity 1.0–1.25 mm long, 0.5 mm wide, mucilaginous, ventrally with wide spongy column, separated by narrow furrows from lateral winged ribs, convex, dorsally smooth and brown; pappus long, a half as long as achene, membranous, bilobed, with long ovoid lobes on ventral side and broad coarsely toothed lobe dorsally. Flowering March to June.

In wormwood deserts and semideserts.—*European part*: Lower Volga; *Caucasus*: Ciscaucasia, Eastern and Southern Transcaucasia; *Soviet Central Asia*: Kara-Kum, mountainous Turkmenia. *General distribution*: Eastern Mediterranean Region, Armenia-Kurdistan, Iran. Described from unknown locality. Type unknown.

Note. The reports (DC. *Prodr.* VI, 52; Vis. in *Giorn. botan. Ital.* II, 1, 35) of the occurrence of *T. parviflorum* in Crimea are erroneous. Apparently, this error began with De Candolle (l.c.), who reported the classic locality of this species as Crimea. The error of De Candolle or Visiani is also repeated by I.P. Mandenova in *Fl. Gruzii* (VIII, 336).

It must be noted that specimens of this species from Armenia usually have pubescent stems, leaves, and peduncles. On Meyer's label such plants are annotated as *puberula*.

GENUS 1528. *Pyrethrum*^{1,2}

Zinn. Catal. Pl. Gotting (1757) 414; Scop. Fl. Carn. ed. 2, II (1772) 148; Gaertn. De fruct. et sem. pl. II (1791) 430, non Medik, 1775.—*Balsamita* Mill. Gard. Dict. Abridg. ed. 4 (1754).—*Gymnocline* Cass. in Bull. Soc. Philom (1816) 199 and in Dict. Sc. Nat. XX (1821) 119 p. p.—*Richteria* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 126.

- 185 Capitula solitary or more numerous, 2–40, less often to 100 (section *Gymnoclines* on single stem, and then usually aggregated in corymbose or corymbose-paniculate inflorescence, usually heterogamous, with 1–50, outer pistillate ligulate florets, in one (less often in more or less 2) row, and numerous bisexual, tubular disk florets, very rarely (in *P. majus*) homogamous, with bisexual tubular disk florets only. Involucre patelliform, less often more or less poculiform, 4–25 mm in dia, 3–8 mm long; involucre bracts herbaceous or coriaceous-herbaceous, imbricate in (2)3–4(5) irregular rows, often more or less membranous along border, less often entirely without border; outer bracts lanceolate or lanceolate-linear, inner oblong or oblong-linear, usually 1.5–2 times, less often (section *Brachyglossa*) more or less 3 times as long as outer. Receptacle usually strongly or weakly convex, less often almost flat, solid, glabrous, more or less punctate-tuberculate, sometimes distinctly alveolate. Corolla of ligulate florets white or pink of different shades, with dorsally flattened but wingless or almost wingless 1.0–2.5 mm long tube and oval, oblong, or linear, less often (section *Gymnoclines*) reniform, 2–25 mm long limb; corolla of tubular disk florets yellow, 1.2–4.0 mm long, usually with shorter tube, in upper half slightly and gradually broadened, less often rather strongly and abruptly broadened (section *Leucanthemopsis*), usually more or less recurved triangular or lanceolate-triangular teeth, 1/7–1/4 as long as tube. Filaments more or less thickened in upper part; anthers lacking distinct basal appendages, with lanceolate-ovoid or broadly lanceolate, usually tubular apical appendages; pollen grains spherical, spiny. Style bifid; style branches linear, truncate. Achenes glabrous, more or less prismatically cylindrical, narrowed toward base, 1.0–3.5 mm long and 0.3–1.0 mm wide, with 5–10 (very rarely to 12) more or less protruding longitudinal ribs. Ligulate florets usually with achenes more or less shifted ventrally; pericarp usually more compactly enclosing kernel (loosely in section *Leucanthemopsis*), lacking mucilaginous cells (less often present, but

¹Treatment by N.N. Tzvelev.

²From the Greek word *pyrethron* or *pyrethros*—the name of a composite used by Dioscorides and Nicander, possibly belonging to this genus.

never in regular rows) and secretory canals; pappus 0.1–1.5 mm long, as more or less toothed or lobed corona along margin, sometimes divided to base in lobes of various form and size or truncate almost to base dorsally, often smaller in ligulate florets than in tubular. Perennial herbs (rarely somewhat woody at base), more or less covered with simple or branched hairs (sometimes entirely glabrous), with erect or basally ascending stem and alternate leaves, more or less divided, less often (sections *Balsamits* and *Balsemitopsis*) with entire laminas.

186 The genus comprises about 100 species, distributed in Europe (except Far North), North Africa, and in the greater part of nontropical Asia (up to Lake Baikal in the east and the Himalayas in the south). The Mediterranean Region, the Caucasus, and Northwest Asia are particularly known for the number and diversity of species; the number of species in the genus significantly decreases toward the north and east of these regions. Fifty-six species are found in the USSR.

Type of genus: *Pyrethrum corymbosum* (L.) Willd.

Note. In recent times, this genus usually is united either with the genus *Tanacetum* L. or with a whole series of other closely related genera under *Chrysanthemum* L. sensu lato, with which one can hardly agree (cf. notes to the genera *Chrysanthemum* and *Tanacetum*). In my opinion, it shows the greatest affinity not so much with the genus *Tanacetum* as with the genera *Trichanthemis* Rgl. and Schmalh. and *Cancrinia* Kar. and Kir., which even O. Hoffmann (*Die natürl. Pflanzenfam.* Teil IV, Abteil 5, 1889, 282–283), who accepted the genus *Chrysanthemum* in the broadest sense, considered as separate genera. The species *P. tianschanicum* possibly might be included with equal justification under either the genus *Pyrethrum* or the genus *Trichanthemis*, but the species *P. majus* and the rarely encountered eligulate specimens of the species in section *Parthenium* could easily be referred formally to the genus *Cancrinia*. Besides, some species of the genus (e.g., *P. komarovii* and *P. tricholobum*) are so similar to species of *Tripleurospermum* Sch. Bip., that in the absence of mature achenes they still occupy a somewhat intermediate position between these genera and have been included in the genus *Pyrethrum*, to some extent, only tentatively. The numerous sections of the genus (unfortunately, their number cannot be reduced satisfactorily), despite their apparent, relatively less distinctness by comparison with the sections of closely related genera, still by no means always show a clear affinity with each other, whereas their relationships with other genera often are even more distinct. All this points to the need for a more detailed revision of the genus making comprehensive use of not only morphological but also anatomical characters, which have not been used in the present description for lack of time.

Economic Importance. Many species of the genus (in particular, *P. parthenium*, *P. coccineum*, etc.) are used as ornamentals; some species (*P. cinerariifolium*, *P. coccineum*, *P. roseum*) produce the insecticidal substance pyrethrum, which is used in the manufacture of different insecticides (pyrethrum powder, etc.). The species *P. majus* and *P. balsamita* are vegetables.

1. Lamina entire, more or less toothed, oblong to broad oval, sometimes lyrate in cauline leaves, with large broadly oval apical lobe and few very small lateral lobes 2.
- 187 + Lamina more or less pinnately cut 5.
2. Limb of corolla of ligulate florets 9–17 mm long. Southern Altai (sect. *Balsamitopsis*) 15. **P. kelleri** (Kryl. and Plotn.) Krasch.
- + Limb of corolla of ligulate florets 4–8 mm long, or ligulate florets entirely absent (sect. *Balsamita*) 3.
3. Ligulate florets absent. Cultivated plant, less often escaped 5. **P. majus** (Desf.) Tzvel.
- + Ligulate florets present. Caucasus 4.
4. Basal leaves with lamina more or less abruptly narrowed in petiole; capitula (5)10–50(70); involucre bracts greenish or brownish 3. **P. balsamita** (L.) Willd.
- + Basal leaves with lamina gradually cuneately narrowed in petiole; capitula (1)2–20(15); involucre bracts usually dark brownish-violet 4. **P. balsamitoides** (Nabel.) Tzvel.
5. Lamina of basal and lower cauline leaves ovate or broadly oval, pinnately lobed, with 2–5 oblong, entire, lobes on each side. Alpine plant, 5–15 cm high. Carpathians (sect. *Leucanthemopsis*) 27. **P. alpinum** (L.) Schrank.
- + Leaves (except uppermost) more or less pinnatisect 6.
6. Plants 50–150 cm high, lacking short nonflowering shoots. Basal leaves withering early; cauline leaves numerous, pinnately parted (or pinnately cut), with entire, more or less toothed lobes. Capitula (8)10–80(100), aggregated at stem apex in compound corymbs; involucre 4–8 mm in dia. Caucasus (sect. *Gymnoclines*) 7.
- + Plants usually shorter, usually with short non-flowering shoots and leaves of various shapes. Capitula fewer, often solitary 8.
7. Involucre 4–6 mm in dia; corolla limb of ligulate florets 2–4 mm long 1. **P. macrophyllum** (W. and K.) Willd.
- + Involucre 5–8 mm in dia; corolla limb of ligulate florets 8–11 mm long 2. **P. sorbifolium** Boiss.
8. Capitula (1)4–25(40), in rather lax corymbose-panicles; involucre 6–11 mm in dia; corolla limb of ligulate florets 5–7 mm long; lamina twice or thrice pinnately cut, with apical lobes up to 1 mm

- wide. Caucasus (sect. *Leptanthemum*) 14. **P. leptophyllum** Stev.
- + Plants of different type 9.
9. Plants silver-gray from dense pubescence or strongly flattened, appressed, bifid hairs. Found only in cultivation (sect. *Cinerariifolia*) 16. **P. cinerariifolium** Trev.
- + Plants glabrous or more or less covered with simple or bifid, usually erect and nonflattened hairs 10.
10. Semishrubs, 5–25 cm high, with thick woody rhizome and long, often more or less branched, woody bases of nonflowering and flowering shoots; apical lobes of leaves linear-filiform, to 0.6 mm wide; capitula solitary 11.
- + Herbs, less often more or less woody at base, but then apical lobes of leaves broad, not linear-filiform 14.
11. Corona of achenes 1.2–2.5 mm long, divided to or almost to base into 6–10 scales or lobes. Western Tien Shan (sect. *Trichanthemopsis*) 42. **P. tianschanicum** Krasch.
- + Corona of achenes 0.2–1.0 mm long. Caucasus (sect. *Xylopyrethrum*) 12.
12. Plants dull green, weakly pubescent; corona of achenes 0.2–0.3 mm long 10. **P. heldreichianum** Fenzl. ex Tchi.
- + Plants grayish, densely pubescent; corona of achenes 0.5–1.0 mm long 13.
13. Outer involucre bracts broadly lanceolate, equal to or two-thirds as long as inner; membranous border of bracts brownish 29. **P. ordubadense** Manden.
- + Outer involucre bracts lanceolate, a half to two-thirds as long as inner; membranous border of bracts very dark brown 28. **P. kotschyi** Boiss.
14. Plants with densely leafy stem and not always with short, nonflowering shoots, usually covered with short simple hairs; all leaves rather long petiolate. Achenes 1.0–1.5 mm long. (sect. *Parthenium*.) 15.
- + Middle and upper cauline leaves sessile, less often short petiolate, but then stem very weakly leafy and achenes larger 22.
15. Receptacle weakly convex; lamina once or twice pinnately cut, with lanceolate or broadly linear apical lobes 6. **P. peucedanifolium** (Sosn.) Manden.
- + Receptacle strongly convex; lamina with apical lobes oblong to almost semicircular 16.
16. Plants grayish from dense fine tomentum 17.
- + Plants green, weakly pubescent (almost glabrous) 18.

17. Lamina with 1st and 2nd order lobes usually entire, oblong-ovate to almost semicircular, often obtuse-crenate or shallow-lobed along margin; involucre 9–11 mm in diameter 13. **P. kubense** Grossh.
- 189 + Lamina with secondary lobes pinnately parted or pinnately lobed, with oblong or ovate apical lobe and other segments; involucre 7–10 mm in dia 12. **P. fruticosum** Biehl.
18. Corolla limb in ligulate florets (0)2.5–6.0(7.0) mm long 19.
- + Corolla limb in ligulate florets (6)7–12(15)mm long 20.
19. Plants yellowish-green, cultivated, sometimes escaped 8. **P. parthenium** (L.) Sm.
- + Plants green, usually wild; lamina more strongly divided 10. **P. grossheimii** Sosn.
20. Capitula solitary or 2–15(20); involucre 9–16 mm in dia; plant of upper mountain zone 9. **P. glanduliferum** Somm. and Lev.
- + Capitula (1)5–20(30); involucre 6–10 mm in dia. Lower mountain plant 21.
21. Lamina with pinnae and pinnules, entire or weakly lobed 7. **P. parthenifolium** Willd.
- + Lamina with lobes pinnately parted or pinnately lobed, with oblong or ovate apical lobe and segments 11. **P. sevanense** Sosn.
22. Receptacle weakly convex, almost flat. Plants usually grayish from dense pubescence, less often (*P. galae*) green and more weakly pubescent, but then leaves pinnately parted 23.
- + Receptacle strongly convex, hemispherical or almost so, less often (in *P. silaifolium*) weakly convex, but then plants green, weakly pubescent, with twice or thrice pinnately cut leaves 29.
23. Involucre 9–20 mm in dia, narrow-patelliform; achenes with 8–12 ribs; leaves twice pinnately cut. Caucasus. (sect. *Richteriopsis*.) 24.
- + Involucre 6–13 mm in dia, poculiform; achenes with 6–8 ribs; leaves less divided. Soviet Central Asia. (sect. *Brachyglossa*.) 26.
24. Outer involucre bracts broadly ovate, with rather wide membranous border 37. **P. aucherianum** DC.
- + Outer involucre bracts narrow-lanceolate, acuminate, lacking or almost lacking membranous border 25.
25. Pubescence appressed, grayish; all involucre bracts acuminate 36. **P. oxylepis** (Bordz.) Tzvel.
- + Pubescence more lax, brown on drying; inner involucre bracts subobtusely 35. **P. sericeum** (Adam) MB.
- 190 26. Outer involucre bracts a third to a half as long as inner. Plant densely tomentose or with simple hairs. Trans Ili Alatau and Ketmen ranges 41. **P. semenovii** (Herd.) Winkl.

- + Outer involucral bracts a half to two-thirds as long as inner; Pubescence of bifid hairs. Western Tadjikistan ranges 27.
- 27. Lamina irregularly pinnately parted, with entire, more or less lobate lobes; plants dull green, more weakly pubescent 39. **P. galae** M. Pop.
- + Lamina pinnately cut, with more or less pinnately parted or lobed lobes; plants grayish from rather dense pubescence 28.
- 28. Pubescence of plants appressed, tomentose, consisting of flexuous simple and bifid hairs 38. **P. hissaricum** Krasch.
- + Pubescence of plants densely tomentose, comprising more or less erect, bifid and simple hairs 40. **P. mikeschinii** Tzvel.
- 29. Apical lobes and segments of leaves broad, broadly ovate to lanceolate, more than 1 mm wide; corona of achenes 0.5–1.5 mm long, toothed or lobed to middle. (sect. *Pyrethrum*.) 30.
- + Apical lobes of leaves linear or linear-lanceolate, to 1 mm or more wide, but then corona of achenes 0.1–0.3 mm long 33.
- 30. Plant dull or grayish green from rather dense pubescence; capitula solitary or 2–6 on single stem. Caucasus 34. **P. poterii** Ldb.
- + Plants green, weakly pubescent 31.
- 31. Involucre and peduncles of capitula glabrous; Plants very weakly pubescent with long simple hairs. Dzhungarian Alatau 33. **P. corymbosiforme** Tzvel.
- + Involucre and peduncles of capitula more or less pubescent; plants primarily comprising bifid hairs 32.
- 32. Involucral bracts with light colored or brownish membranous border; receptacle 2–3 times as wide as long. A widely distributed species 31. **P. corymbosum** (L.) Willd.
- + Involucral bracts with dark brown, usually wider membranous border; receptacle usually 1.5 times as wide as long. Carpathians 32. **P. clusii** Fisch. ex Rchb.
- 33. Leaves with broader apical lobe and segments less often (in *P. tricholobum* and *P. komarovii*) narrower, linear or linear-filiform; corona 0.1–0.4 mm long, very rarely (in *P. komarovii*) 0.5–1.3 mm long. Caucasus. (sect. *Pyrethrellum*.) 34.
- + Leaves with narrower, linear or linear-lanceolate lobes; corona 0.4–1.5 mm long, less often to 0.3 mm. Siberia and Soviet Central Asia. (sect. *Richteria*.) 43.
- 191 34. Apical lobes of leaves linear-filiform, up to 0.8 mm wide 35.
- + Apical lobes and segments of leaves broader, almost semicircular to oblong or broadly lanceolate 36.
- 35. Corona 0.5–1.3 mm long. Southern Transcaucasia 26. **P. komarovii** Sosn.

- + Corona 0.2–0.3 mm long. Main Caucasus Range 25. **P. tricholobum** Sosn. ex Manden.
- 36. Ligulate florets pink of different shades 37.
- + Ligulate florets white 38.
- 37. Lamina pinnately cut, with pinnae more or less dentate or pinnately lobed; cauline leaves rather numerous 19. **P. roseum** (Adam) MB.
- + Lamina twice-pinnately cut; cauline leaves fewer 20. **P. coccineum** (Willd.) Worosch.
- 38. Plants 20–80 cm high, with rather densely leafy stem and weakly developed short nonflowering shoots; lamina pinnately cut, with segments more or less toothed or lobate 39.
- + Plants 5–50 cm high, with weakly leafy stem and well developed, short nonflowering shoots; lamina of basal and lower cauline leaves pinnately cut, with pinnately parted segments 40.
- 39. Marshy plants, with oblong, rooting, nonflowering shoots at base. Ranges of the Lesser Caucasus 17. **P. punctatum** (Desr.) Bordz.
- + Rupicolous and meadow plants with short nonflowering branches. Abkhazian ASSR 18. **P. marionii** Albov.
- 40. Involucre 12–17 mm in dia; achenes 2.4–3.0 mm long with very short (about 0.1 mm long), finely toothed corona. Western part of the Greater Caucasus (upper reaches of the Rioni River) 21. **P. chamaemelifolium** (Sosn. and Lev.) Sosn.
- + Involucre 8–13 mm in dia; achenes 1.8–2.5 mm long with longer (0.2–0.5 mm long), more or less toothed corona. Eastern part of the Greater Caucasus 41.
- 41. Plants 10–40 cm high, not aromatic, usually covered with sparse bifid and simple hairs; capitula on long (up to 25 cm long) peduncles; receptacle weakly convex, almost flat 22. **P. silaifolium** Stev.
- + Plants 5–18 cm high, strongly aromatic, usually covered with simple hairs; capitula on shorter (to 3–4 cm long) peduncles; receptacle strongly convex, almost hemispherical 42.
- 42. Leaves more or less pubescent, usually dull green; outer involucre bracts broadly lanceolate, more or less pubescent 23. **P. daghestanicum** (Rupr. ex Boiss.) Rupr. ex Fler.
- 192 + Leaves glabrous or subglabrous; green; outer involucre bracts lanceolate, glabrous or subglabrous 24. **P. aromaticum** (Rupr. ex Boiss.) Tzvel.
- 43. Leaves more or less grayish or whitish from dense pubescence. Soviet Central Asia, southern Altai 44.
- + Leaves green, less often dull green, more or less sparsely pubescent to glabrous and subglabrous; less often (in *P. lanuginosum* from Sayans) more or less sparsely floccose-tomentose 47.

44. Corona of achenes usually not more than a half (less often to two-thirds) irregularly toothed or lobed Dzhungarian Alatau 50. **P. songaricum** Tzvel.
+ Corona of achenes divided to base in oblong or linear-oblong scales 45.
45. Plants 3–15 cm high, covered with rather densely tomentose bracts through which outline of laminas and involucre are scarcely visible. Central Tien Shan 58. **P. leontopodium** (Winkl.) Tzvel.
+ Plants less densely hairy; outline of laminas and involucre bracts quite distinct 46.
46. Plants 5–25 cm high, with less densely hairy, usually somewhat grayish leaves; capitula solitary; blackish-brown membranous border on involucre bracts wide, quite distinct 51. **P. pyrethroides** (Kar. and Kir.) B. Fedtsch. ex Krasch.
+ Plants 12–30 cm high, with more densely hairy, usually whitish-pubescent leaves; capitula solitary or 2–3 on single stem; blackish-brown membranous border on involucre bracts narrower, less distinct because of dense pubescence 52. **P. neglectum** Tzvel.
47. Corona of achenes to base, less often almost to base, divided in oblong scales. Plants 5–25(35) cm high, with twice-pinnately cut leaves. Soviet Central Asia 48.
+ Corona of achenes usually to a half (less often to two thirds) irregularly toothed or lobed. Plants (5)15–50(70) cm high 50.
48. Leaves usually dull green, less often pubescent to subglabrous; bases of capitula and their peduncles always more or less pubescent 53. **P. transiliense** (Herd.) Rgl. and Schmalh.
+ Plant entirely glabrous 49.
49. Plants 8–25 cm high; twice-pinnately cut, with linear-lanceolate and linear-subulate lobes 54. **P. arassanicum** (Winkl.) O. and B. Fedtsch.
+ Plants 5–12 cm high; leaves pinnately cut, with pinnately parted or even pinnately lobed lobes, secondary lobes shorter 55. **P. djilgense** (Franch.) Tzvel.
- 193 50. Plants 25–70 cm high; lamina of basal leaves to 4–5 cm wide, twice or thrice pinnately cut; cauline leaves twice pinnately cut ... 51.
+ Plants 5–30 cm high; lamina of basal leaves to 1.5–2.0 cm wide, pinnately cut, with more or less pinnately parted segments (sometimes partly entire); cauline leaves pinnately cut, with entire or partly 2–5-parted segments 53.
51. Capitula solitary, very rarely 1–2 per stem. Altai 44. **P. krylovianum** Krasch.
+ Capitula 2–8 per stem, very rarely solitary 52.

52. Involucre 8–12 mm in dia; ligulate florets 6–18, with 7–12 mm-long corolla limb 45. **P. abrotanifolium** Bge. ex Ldb.
 + Involucre 10–18 mm in dia; ligulate florets 18–35, with 12–15 mm-long corolla limb 43. **P. alatavicum** (Herd.) O. and B. Fedtsch.
53. Peduncles of capitula dull whitish-tomentose above; involucre 10–15 mm in dia, whitish-tomentose only at base; ligulate florets 10–20. Siberia 46. **P. pulchellum** Turcz.
 + Peduncles of capitula densely tomentose; involucre 13–28 mm in dia; involucre bracts densely tomentose at base and dorsally; ligulate florets 15–35 54.
54. Leaves more or less floccose-tomentose, glabrescent, usually also near base of branches in leaf axils. Sayan Mountains 47. **P. lanuginosum** (Sch. Bip. and Herd.) Tzvel.
 + Plants with weakly pubescent leaves, not tomentose at base of branches. Altai and Soviet Central Asia 55.
55. Corolla limb of ligulate florets broadly linear, corolla of tubular florets 2–3 mm long, Soviet Central Asia 49. **P. karelinii** Krasch.
 + Corolla limb of ligulate florets linear or narrow-linear; corolla of tubular florets 3.0–3.5 mm long, Altai 48. **P. pulchrum** Ldb.

Section 1. *Gymnoclines* (Cass.) DC. Prodr. VI (1837) 57 p. p.—*Pyrethrum* sect. *Leucogymnocline* (Sch. Bip.) Boiss. Fl. or. III (1875) 346.—*P.* sect. *Gymnocline* (Cass.) Sosn. subsect. *Leucogymnocline* (Sch. Bip.) Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 44.—*Gymnocline* Cass. in Bull. Soc. Philom. (1816) 199 and in Dict. Sc. Nat. XX (1821) 119 p. p.—*G.* sect. *Leucactis* C. Koch in Linnaea, 339.—*Tanacetum* sect. *Leucogymnocline* Sch. Bip. Tanacet. (1844) XXIV (1851)/53.—*Chrysanthemum* sect. *Gymnoclinia* Benth. and Hook. f. Gen. pl. II (1876) 427 p. p.—*C.* sect. *Gymnocline* (Cass.) Hoffm. in 194 Pflanzenfam. IV, 5 (1889) 278 p. p.—Herbaceous plants, 50–150 cm high, more or less covered with short and long simple hairs, with densely leafy stem, without short nonflowering branches; leaves pinnatisect. Capitula numerous, from (5)10 to 100(150), aggregated at stem apex in dense or somewhat lax corymbs; involucre narrow-patelliform, 4–8 mm in dia; outer involucre bracts a half to two-thirds as long as inner; receptacle weakly convex; corolla limb of ligulate florets 2–11 mm long; corolla of tubular florets 1.8–2.4 mm long, with slightly gradually broadened tube and lanceolate-triangular teeth in upper half. Achenes 1.6–2.5 mm long, with 5–8 longitudinal ribs, more or less shifted ventrally in ligulate florets; corona 0.2–0.3 mm long, irregularly toothed to not more than middle, sometimes distinctly lobed.

Type of section: *Pyrethrum macrophyllum* (W. and K.) Willd.

Note. This small section is, apparently, one of the most primitive in the genus, which is indicated by the unique habit of the species of this section as well as by their adaptation to shady forests and extremely sporadic distribution. Beginning with H. Cassini (l.c.), it was often, but without sufficient justification, combined in a single section or genus with species of the section *Xanthoglossa* (DC.) Sch. Bip. of the genus *Tanacetum* L.

1. **P. macrophyllum** (W. and K.) Willd. Sp. pl. III (1803) 2154; DC. Prodr. VI, 58; Ldb. Fl. Ross. II, 553; Boiss. Fl. or. III, 346; Sosn. in Tr. Tifl. Bot. Sada, XVII, 44; Grossh. Fl. Kavk. IV, 139 and Opred. Rast. Kavk. 460; Stank. in Stank. and Tal. Opred. Rast. Evrop. Ch. SSSR, 631.—*Chrysanthemum macrophyllum* Waldst. and Kit. Pl. rar. Hung. I (1802) 97, t. 94, non Biehl. 1807.—*Gymnocline leucocephala* Cass. in Dict. Sc. Nat. XX (1821) 120, nom. nov.—*C. macrophylla* (W. and K.) Bluff and Fingerh. Fl. Germ. II (1825) 389.—*Achillea sambucifolia* Desf. Cat. paris. (1829) 180.—*Tanacetum macrophyllum* (W. and K.) Sch. Bip. Tanacet. (1844) 53.—**lc.**: Waldst. and Kit. l.c.; Rchb. lc. Fl. Germ. XVI, t. 995; Hegi, Ill. Fl. VI, 2, f. 329; Jav. and Csap. lc. Fl. Hung. 522.—**Exs.**: Fl. exs. Austro-Hung. No. 659; Fl. Bohem. et Morav. exs. No. 395.

Perennial. Plants 50–150 cm high, with thick inclined rhizome, usually covered with long and short (to papilliform) simple hairs, lacking short nonflowering branches; stems solitary or few, erect, densely leafy, branched only at apex (in inflorescence). Leaves green and glabrous above, less often pubescent, dull green beneath, more densely pubescent, weakly punctate-glandular; basal leaves withering early; cauline leaves sessile or sub-sessile; lamina more or less lanceolate-ovate, pinnately-parted up to winged rachis, lobes 4–8 on each side, more or less lanceolate, 8–25 mm wide, acute, more or less duplicicodentate along
 195 margin, sometimes pinnatilobate. Capitula (20)40–100(150), aggregated in dense, compound corymbs, on 4–15 mm long peduncles. Involucre 4–6 mm in dia and 3.5–4.5 mm long, more or less crisped-hairy; involucre bracts herbaceous, outer narrow-lanceolate, inner 1.5 times, rarely 2 times as long, oblong-linear or linear; all bracts with rather narrow, dark brown, membranous border, apex of inner bracts appendiculate. Ligulate florets 5–10, white, with tube about 1 mm long and roundish or reniform limb; 2–4 mm long and 2.5–3.5 mm wide; corolla of tubular florets 1.8–2.4 mm long. Achenes 1.6–2.0 mm long, with 5 longitudinal ribs, in ligulate florets more or less shifted ventrally; corona 0.2–0.3 mm long, finely toothed. Flowering July to August.

In forests, among shrubs, subalpine meadows at altitudes to 2,500 m.—*European part*: Reported by Stankov (op. cit.) for western regions of Ukraine; *Caucasus*: Eastern Transcaucasia (western part), Western Transcaucasia, Southern Transcaucasia (northern and western parts), Dagestan (southern part). *General distribution*: Scandinavia (rarely), Central Europe (sporadically), Balkans-Asia Minor. Described from Hungary. Type in Vienna or Budapest.

Note. *P. macrophyllum* var. *angustifolium* Ldb. (*Fl. Ross.* II, 554), described from Nordman's collections from Georgia; according to Mandenova (in *Zam. po Sist. Geogr. Rast.* XXII, 1961, p. 62) it is a synonym of *Achilles latiloba* Ldb.

2. ***P. sorbifolium*** Boiss. *Fl. or.* III (1875) 343; Manden. in *Fl. Gruzii.* VII (1952) 360.

Perennial. Plants 50–150 cm high, with short inclined rhizome, more or less sparsely covered with short (often papilliform), simple hairs, lacking short non-flowering branches; stems solitary or few, erect, densely leafy, branches only at apex (in inflorescence). Leaves green, more or less pubescent to entirely glabrous, lacking distinct punctate glandular hairs; basal leaves withering fast; cauline leaves up to 15–20 cm long and 10–12 cm wide, lower rather long-petiolate, others short-petiolate or subsessile, their lamina ovate or oblong, pinnately cut or pinnately parted up to narrow-winged rachis, segments 3–6 on each side, linear-lanceolate, 4–15 mm wide, acute, acutely duplicicodentate. Capitula (5)10–30(40), aggregated in lax compound corymbs, on 2–6 cm long peduncles. Involucre 5–8 mm in dia and 3.5–5.0 mm long, glabrous or subglabrous; involucre bracts coriaceous-herbaceous, outer lanceolate more or less lacking membranous border, inner 1.5–2 times as long, linear-oblong, with appendiculate, brownish membranous border in upper part. Ligulate florets numerous, white, with corolla tube 1.0–1.5 mm long and oblong-linear limb 8–11 mm long and 2–3 mm wide; corolla of tubular florets 1.8–2.4 mm long, 196 achenes 2.2–2.5 mm long, with 5–8 longitudinal ribs, in ligulate florets shifted ventrally; corona about 0.2 mm long, obtusely fine-toothed along margin. Flowering June to July.

Forests, forest glades, subalpine meadows in upper mountain zone.—*Caucasus*: Western Transcaucasia (Adzharian ASSR). *General distribution*: Turkey. Described from Turkey. Type in Geneva.

Note. It occupies a fairly isolated position and was included by Boissier under a different section of the genus. In the structure of the capitulum it comes closer to the species of the following section.

Section 2. *Balsamita* (Mill.) DC. Prodr. VI (1837) 62.—*P. sect. Eupyrethrum* Sosn. subsect. *Balsamita* (Mill.) Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 38.—*Balsamita* Mill. Gard. Dict. Abridg. ed. 4 (1754); Desf. in Act. Soc. Hist. Nat. Paris, I (1792) 1.—*Tanacetum* sect. *Balsamita* (Mill.) Sch. Bip. Tanacet. (1844) 50.—Plants herbaceous, 20–120 cm high, more or less covered with short, appressed bifid hairs, usually mixed with simple hairs, with densely leafy stem and weakly developed short nonflowering branches. Leaves entire, less often lyrate. Capitula usually numerous, aggregated at stem apices in dense or somewhat lax corymbs, very rarely solitary. Involucre narrow-patelliform, 5–10 mm in dia; outer bracts $\frac{2}{3}$, less often $\frac{1}{2}$, as long as inner. Receptacle weakly convex, almost flat. Corolla limb in ligulate florets 4–8 mm long; corolla of tubular florets 2.0–2.5 mm, with slightly and gradually broadened tube in upper half and triangular, weakly recurved teeth. Achenes 2.0–2.5 mm long, with 5–8 longitudinal ribs, in ligulate florets more or less shifted ventrally; corona 0.1–0.3 mm long, irregularly toothed or lobed to middle or almost to base.

Type of section: *Pyrethrum majus* (Desf.) Tzvel.

Note. A widely distributed cultivated species of this section, *P. majus*, without ligulate pistillate florets, was, for long, sometimes separated a separate genus, *Balsamita* Mill., and sometimes combined with the genus *Tanacetum* L. However, as demonstrated even by De Candolle, this species is so close in all characters to other species of the section included in the genus *Pyrethrum* that there cannot be any doubt about the affinity of this section to this genus. All species in this section (about 5) are close ecogeographic races of the same genus and distributed almost exclusively (except *P. majus*) in the countries of Northwest Asia.

3. *P. balsamita* (L.) Willd. Sp. pl. III (1803) 2153; DC. Prodr. VI, 63; Ldb. Fl. Ross. II, 558; Boiss. Fl. or. III, 345, excl. var.; Grossh. Fl. Kavk. IV, 134 and Opred. Rast. Kavk. 460.—*Chrysanthemum balsamita* L. Sp. pl. (1763) 1252.—*C. balsamita* var. *radiatum* Schmalh. 197 Fl. II (1897) 69.—*Matricaria balsamita* (L.) Desr. in Lam. Encycl. III (1792) 733.—*Tanacetum balsamitoides* Sch. Bip. Tanacet. (1844) 51, nom. nov.—*Leucanthemum balsamita* (L.) Over. Fl. S. Dakota (1932) 108.

Perennial. Plants 30–120 cm high, with more or less branched, short creeping rhizome, usually dull green from soft and appressed bifid (mixed with simple) hairs; stems few or solitary, erect, densely leafy, more or less branched above. Leaves dull green from rather dense pubescence, with numerous punctate-glandular hairs, entire, more or less obtusely toothed along margin; basal leaves rather long petiolate

(petiole often as long as lamina) with oblong, more or less abruptly narrowed lamina at base; cauline leaves short-petiolate or sessile, oval, uppermost strongly reduced, often entire. Capitula 10–60, on rather long peduncles, in somewhat lax, compound, corymbs. Involucre 6–10 mm in dia, 3–4 mm long, more or less pubescent; involucre bracts coriaceous-herbaceous, green or greenish-brown, outer lanceolate, almost lacking border, inner 1.5, less often 2 times as long, linear-lanceolate, with light colored or brownish membranous border in upper part, apically broadened appendiculately. Ligulate florets 6–20, white, with corolla tube about 1 mm long and limb 4–6 mm; corolla of tubular florets about 2 mm long. Achenes 2.0–2.4 mm long, about 0.6–0.7 mm wide, with (5)6–7(8) longitudinal ribs; corona about 0.2 mm long, more or less irregularly toothed or lobed along margin. Flowering July to August.

Stony slopes, scrubs, meadows up to upper mountain zone, often cultivated and escapes, found along city streets, by roadsides, in parks and kitchen gardens.—*Caucasus*: Transcaucasia, Talysh. *General distribution*: Asia Minor, Armenia-Kurdistan, Iran. Described from garden specimens of stock from north-eastern Turkey. Type in London.

Note. The more alpine specimens, usually more weakly pubescent and with a darker membranous border on the involucre bracts and which are transitional to the next species, are described as a separate variety—*Chrysanthemum balsamita* var. *viride* Brodz. [in *Tr. Bot. Sada Yur'evsk. Univ.* XIII (1912) 24] and the form *C. balsamita* f. *glabrescens* Nabelek [in *Publ. Fac. Sc. Univ. Masaryk, Brno*, LII (1925) 22].

In the countries of Northwestern Asia; a species with lyrate-pinnatisect leaves, which is very close to this species and, apparently, has evolved in cultivation, also is cultivated—*Pyrethrum pinnatifidum* Willd. [Willd. *Sp. pl.* III (1803) 2154; *P. multifidum* (Desf.) DC. *Prodr.* VI (1837) 63; *Matricaria tanacetifolia* Desr. in *Lam. Encycl.* III (1792) 733, non *Pyrethrum tanacetifolium* Boiss. 1875; *Chrysanthemum multifidum* Desf. *Cat. horti Paris.* (1829) 170; *C. glaucum* Pers. *Syn. pl.* II (1807) 461]. This species has not yet been reported from the Caucasus, although its occurrence as a cultivated or introduced plant is quite probable.

198 **Economic Importance.** Widely cultivated as an aromatic vegetable in the countries of Northwest Asia and the Caucasus.

4. ***P. balsamitoides*** (Nabel.) Tzvel. comb. nova.—*Chrysanthemum balsamitoides* Nabel. in *Publ. Fac. Sc. Univ. Masaryk. Brno*, LII (1925) 22, t. V, fig. 2.— **Ic.:** Nabelek, *ibid*.

Perennial. Plants 20–50 cm high, with strongly branched creeping rhizome, more or less covered with appressed bifid hairs to almost

glabrous; stems usually few, erect or ascending at base, densely leafy, more or less branched above, or simple. Leaves green or dull green from pubescence, often almost glabrous, with few but not always distinct punctate-glandular hairs, entire, more or less toothed; basal leaves on long (often as long as lamina or longer) petioles, with oblong or obovate lamina gradually narrowed toward base; cauline leaves oval or ovate, lower short-petiolate, upper sessile or subsessile. Capitula solitary or 2–10(15), in somewhat lax racemose inflorescence. Involucre 8–10 mm in dia and 4–5 mm long, more or less pubescent to subglabrous; involucre bracts coriaceous-herbaceous, usually dark brownish-violet, outer lanceolate, with very narrow membranous border, inner not more than 1.5 times as long, linear-oblong, with dark brown membranous border appendiculately broadened at apex. Ligulate florets white, with corolla tube about 1 mm long and limb 6–8 mm long; corolla of tubular florets 1.8–2.0 mm long. Achenes 1.8–2.4 mm long and about 0.5 mm wide with 5–7 longitudinal ribs; corona 0.1–0.3 mm long, more or less lobed or irregularly toothed. Flowering July to August.

Stony slopes, meadows at altitudes higher than 2500 m.—*Caucasus*: Southern Transcaucasia. *General distribution*: Armenia-Kurdistan. Described from northeastern Turkey. Type in Brno (Czechoslovakia).

Note. A high-mountain, morphologically poorly isolated race, it is related to the previous species through transitional forms. The most typical form is found in the alpine meadows of Aragats Mountain.

5. **P. majus** (Desf.) Tzvel. comb. nova.—*P. tanacetum* DC. Prodr. VI (1837) 63, nom. nov.—*P. balsamita* var. *tanacetoides* Boiss. Fl. or III (1875) 346; Sosn. in Tr. Tifl. Bot. Sada, XVII, 39; Grossh. Fl. Kavk. IV, 134.—*Tanacetum balsamita* L. Sp. pl. (1753) 845; Klovov in Vozn. Rosl. URSR (1950) 538.—*Balsamita major* Desf. in Act. Soc. 201 Hist. Nat. Paris. I (1792) 3, nom. nov.—*B. vulgaris* Willd. Sp. pl. III (1803) 1802, nom. nov.—*B. suaveolens* Pers. Syn. pl. II (1807) 408, nom. nov.—*B. balsamita* (L.) Rydb. in N. Am. Fl. XXXIV (1916) 238.—*Chrysanthemum majus* (Desf.) Aschers. Fl. Brandenb. (1864) 329.—*C. balsamita* auct. non L.: Schmalh. Fl. II, 69, excl. var.—*Leucanthemum balsamita* (L.) Stank. in Stank. and Tal. Opred. Rast. Evrop. Ch. SSSR (1949) 630, non Over. 1932.—*Ic.*: Rchb. Ic. Fl. Germ. XVI (1854) t. 995; Syreistsch. Ill. Fl. Mosk. Gub. III, 267; Bonnier, Fl. Compl. France, Suisse et Belg. V, t. 292; Hegi, Ill. Fl. VI, 2, 599; Jav. and Csap. Ic. Fl. Hung. 524.

Plants 30–120 cm high, with more or less branched short-creeping rhizome, usually covered with short, appressed bifid (mixed with simple) hairs. Stems few or solitary, erect, densely leafy, usually branched above. Leaves usually dull green due to pubescence, sometimes

subglabrous, with numerous punctate glandular hairs, entire, more or less toothed; basal leaves long-petiolate, with oblong, more or less abruptly narrowed lamina near base; cauline leaves short-petiolate or sessile, oval, uppermost strongly reduced. Capitula 10–60, on shorter peduncles, in rather dense, compound, corymbs. Involucre 6–8 mm in dia, 3–4 mm long, more or less hairy; involucre bracts coriaceous-herbaceous, greenish; outer bracts lanceolate, usually lacking border, inner 1.5, less often 2 times as long, linear-oblong, with light-colored, apically apendiculately broadened, membranous border. Ligulate florets entirely lacking; corolla of tubular florets about 2 mm long. Achenes 1.8–2.4 mm long, about 0.6 mm wide, with 5–8 longitudinal ribs and 0.1–0.3 mm long corona, more or less irregularly toothed along margin. Flowering July to September.

Cultivated in parks and kitchen gardens, and often escapes.—*European part*: Mostly more southern and western districts; *Caucasus*: Occasionally cultivated and escapes; *Soviet Central Asia*: Occasionally cultivated. *General distribution*: Europe (except Far North), North-west Asia. Described from Southern Europe. Type in London.

Note. Apparently, a species that has appeared in cultivation, differing from the original species, *P. balsamita*, not only in the absence of ligulate florets, but also in having a denser inflorescence.

Economic Importance. It is an aromatic vegetable, also used in folk medicine and has insecticidal properties.

Section 3. Parthenium (Briq.) Tzvel. comb. nova.—*Tanacetum* sect. *Leucoglossa* § 1. *Microsperma* Sch. Bip. Tanacet. (1844) 55.—*T.* sect. *Pyrethrum* subsect. *Parthenium* Briquet in Burnat. Fl. Alp. Marit. VI (1916) 119.—Herbaceous plant, 15–80 cm high, more or less pubescent (to subglabrous), with densely leafy stem and more weakly developed, short nonflowering shoots; leaves pinnatisect, all rather long-petiolate. Capitula usually rather numerous, in lax or more or less dense, sometimes irregular corymbs, less often solitary. Involucre narrow-patelliform, 6–16 mm in dia; outer involucre bracts a half to two-thirds as long as inner. Receptacle usually strongly convex, conically hemispherical, rarely (in *P. peucedanifolium*) weakly convex. Corolla limb in ligulate florets 2.5–15.0 mm long, sometimes ligulate florets entirely lacking; corolla of tubular florets 1.2–2.0 mm long, with gradually slightly broadened tube in upper half and deltoid, weakly recurved teeth. Achenes 1.0–1.8 mm long, with 5–10 longitudinal ribs, in ligulate florets more or less ventrally shifted; corona 0.1–0.6 mm long, more or less irregularly toothed along margin or divided almost to base into 5–10 lobes of different shape and size.

Type of section: *Pyrethrum parthenium* (L.) Sm.

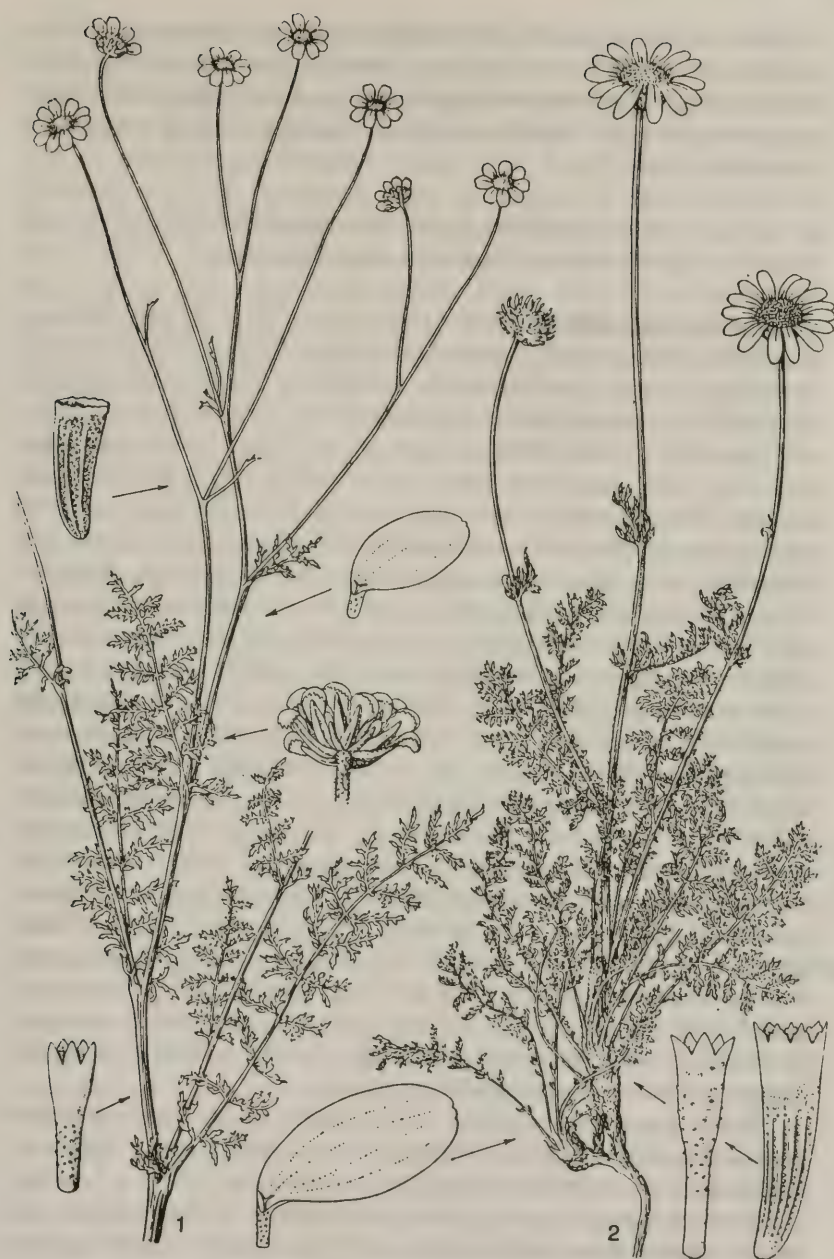


Plate VIII.

1 — *Pyrethrum leptophyllum* Stev., habit of plant, involucre, corolla of ligulate floret, corolla of tubular floret, achene; 2 — *P. sangaricum* Tzvel., habit of plant, corolla of ligulate floret, corolla of tubular floret; achene.

Note. About 15 species of the section are distributed mainly in the countries of Western Asia and the Caucasus. One species is widely distributed in the mountainous regions of Southern Europe and a large part of Asia, while another species (*P. parthenium*) is a common ornamental plant.

Series 1. Peucedanifolia Tzvel.—Receptacle weakly convex, almost flat. Apical lobes of leaves linear or lanceolate.

6. ***P. peucedanifolium*** (Sosn.) Manden. in Zam. po Sist. i Geogr. Rast. Bot. Inst. Akad. Nauk Gruz. SSR, XXII (1961) 59.—*P. ?parthenifolium* var. *peucedanifolia* Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 35.—*P. svanicum* M. Pop. ex Manden. l. c. in syn.

Perennial. Plants 30–80 cm high, with shorter tap root, covered with very short, appressed, simple hairs. Stems erect, densely leafy, usually branched only at base and apex (in inflorescence), but with short branches in axils of middle and upper cauline leaves. Leaves dull green from rather dense pubescence, with numerous punctate glandular hairs, all rather long petiolate; basal and lower cauline leaves withering very early; lamina deltoid-ovate, pinnately cut upto more or less wingless rachis, with 2–5 lobes on each side, partly entire, but usually lobes more or less pinnately parted; apical lobes linear or lanceolate, usually 1.0–2.5 mm wide, narrowed toward subobtusely or subacute apex; upper cauline leaves smaller and weakly divided. Capitula 5–20 on single stem, on 2–8(10) cm long peduncles, in lax, sometimes irregular corymbs. Involucre 7–10 mm in dia, 3–4 mm long, rarely puberulent; involucre bracts coriaceous-herbaceous, outer narrow-lanceolate, lacking border, inner lanceolate-linear and linear, with appendiculately broadened, light colored, membranous border at apex. Ligulate florets 203 white, with corolla tube about 1 mm long and limb 6–8 mm long; corolla of tubular florets 1.5–2.0 mm long. Achenes 1.2–1.6 mm long, with 5–8 oblong ribs and 0.3–0.6 mm long corona, divided to or almost to base into 5–10 lanceolate or lanceolate-subulate lobes of different shapes and sizes. Flowering July to August.

River gravel beds, scrubs, forest glades up to lower mountain zone.—*Caucasus*: Western Transcaucasia (northern part). Endemic. Described from northern Georgia. Type in Tbilisi.

Note. A unique species, close to the species of the previous section in general habit and structure of the receptacle, differing from them, however, by smaller achenes and the nature of the pubescence.

Series 2. Parthenifolia Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 32.—Receptacle strongly convex, conically hemispherical. Apical lobes and segments of leaves oblong to almost semicircular.

7. ***P. parthenifolium*** Willd. Sp. pl. III (1803) 2156; MB. Fl. taur.-cauc. II, 325 and III, 579; DC. VI, 58; Ldb. Fl. Ross. II, 552; Boiss. Fl. or. III, 344; O. and B. Fedtsch. Perech. Rast. Turk. IV, 187; Grossh. Fl. Kavk. IV, 138 and Opred. Rast. Kavk. 462.—*P. parthenium* var. *parthenifolium* (Willd.) Lipsky, Fl. Kavk. (1899) 349.—*P. parthenifolium* var. *latilobum* Sosn. in Grossh. Fl. Kavk. IV (1934) 138, diagnosis in Russian.—*P. latilobum* (Sosn.) Sosn. in Zam. po Sist. i Geogr. Rast. Inst. Bot. Akad. Nauk Gruz. SSR, XV (1949) 6; Manden. in Fl. Gruzii, VIII, 363, Plate 398.—*Chrysanthemum parthenifolium* (Willd.) Pers. Syn. pl. II (1807) 462; B. Fedtsch. Rast. Turk. 737.—*C. parthenium* var. *parthenifolium* (Willd.) Schmalh. Fl. II (1897) 69.—*Tanacetum parthenifolium* (Willd.) Sch. Bip. Tanacet. (1844) 56.—**lc.**: Rchb. Ic. Fl. Germ. XVI (1854) t. 992; Manden. op. cit.—**Exs.**: A. Callier, Iter. taur.-tertium, No. 636; P. Sintenis, Iter transcasp.-pers. No. 1727.

Perennial. Plants 15–70 cm high, with shorter tap root, more or less puberulent to subglabrous. Stem erect, densely leafy, more or less branched near base and above. Leaves green or dull green from more dense pubescence with numerous punctate glandular hairs, all rather long-petiolate; basal and lower cauline leaves 10–15 cm long, often withering early; lamina of lower cauline leaves more or less ovate, pinnately parted or pinnately cut, with 3–7 oblong or ovate, more or less pinnatilobate lobes; lobes entire or more or less blunt-toothed, subacute; upper cauline leaves strongly reduced and weakly divided. Capitula (1)5–20(30), on rather long (to 10 cm) peduncles, in lax or somewhat lax corymbs, or corymbose-panicles. Involucre 6–9 mm in dia, 3–4 mm long, more or less pubescent to subglabrous. Involucral bracts coriaceous-herbaceous, outer lanceolate, almost lacking border, inner 1.5–2 times longer, oblong-linear, with narrow, light colored, membranous border, appendiculately broadened at apex. Ligulate florets 8–20, white, with corolla tube 1–1.5 mm long, and limb 7–10 mm long; corolla of tubular florets 1.2–1.8 mm long. Achenes 1.2–1.8 mm long, about 0.4 mm wide, with 5–10 longitudinal ribs and about 0.2 mm long corona, more or less irregularly obtusely toothed along margin. Flowering June to September.

More or less shaded stony slopes, rocks, especially in forests and scrubs up to 2,000(2,500) m.—*European part*: Crimea (mountains); *Caucasus*: All regions, but rarely in Southern Transcaucasia; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan, Amu-Darya (mountains), Pamiro-Alai Region (excluding Pamir), mountainous Turkmenia. *General distribution*: Mediterranean Region, Balkans-Asia Minor, Armenia-Kurdistan, Iran, Dzhungaria-Kashgaria. Described from garden specimens of unknown origin (possibly from Caucasus?). Type in Berlin.

Note. The species *P. latilobum* (Sosn.) Sosn., described from Georgia with slightly broader leaf lobes and, on the average, larger capitula, is morphologically so weakly isolated that, in my view, it is more an ecological form than a separate ecogeographical race. *P. parthenifolium* var. *anthriscifolium* Sosn. (Grossh. *Fl. Kavk.* IV, 138), with thin, somewhat more strongly divided lobes of the leaves, and *P. parthenifolium* var. *macrophyllum* Sosn. (Grossh. *Fl. Kavk.* IV, 138), with larger leaves, also have hardly any taxonomic significance.

Economic Importance. Sometimes cultivated as an ornamental plant and rarely escapes, occurring also in the more northern regions.

8. ***P. parthenium*** (L.) Sm. *Fl. brit.* II (1800–1804) 900; MB. *Fl. taur.-cauc.* III, 579; DC. *Prodr.* VI, 58; Ldb. *Fl. Ross.* II, 553; Boiss. *Fl. or.* III, 314; Grossh. *Fl. Kavk.* IV, 137 and *Opred. Rast. Kavk.* 462; Manden. in *Fl. Gruzii*, VIII, 360.—*Matricaria parthenium* L. *Sp. pl.* (1753) 890.—*M. latifolia* Gilib. *Fl. lithuan.* I (1781) 220.—*Chrysanthemum parthenium* (L.) Pers. *Syn. pl.* II (1807) 462; Schmalh. *Fl.* II, 69, excl. var.—*Tanacetum parthenium* (L.) Sch. Bip. *Tanacet.* (1844) 55.—*Leucanthemum parthenium* (L.) Gren. and Godr. *Fl. Fr.* II (1850) 145.—*Parthenium matricaria* Gesn. ex Rupr. *Fl. ingr.* I (1860) 583.—**Ic.:** Rchb. *Ic. Fl. Germ.* XVI (1854) t. 992; B. Fedtsch. and Fler. *Fl. Evrop. Ross.* 975, Fig. 976; Hegi, *Ill. Fl.* VI, 2, fig. 330 and 331.

Perennial. Plants 15–50 cm high, with shorter tap root, more or less puberulent to subglabrous. Stem erect, densely leafy, more or less branched at base and above. Leaves as in previous species, but usually yellowish-green and, on the average, less hairy. Capitula (1)5–20(30), on rather long (to 8 cm) peduncles, in rather dense corymbs. Involucre 6–8 mm in dia, 3–4 mm long, more or less pubescent, subglabrous; involucre 205
involucral bracts coriaceous-herbaceous, outer lanceolate, more or less lacking border, inner 1.5–2 times as long, oblong linear, with narrow, light colored, membranous border, more or less divided at apex. Ligulate florets 5–15, white, with corolla tube 1 mm long and limb 2.5–6.0 mm long, sometimes entirely lacking; corolla of tubular florets 1.2–1.8 mm long. Achenes 1.2–1.5 mm long and about 0.4 mm wide with 5–8 longitudinal ribs; corona about 0.2 mm long, more or less irregularly toothed along margin, strongly reduced in ligulate florets. Flowering July to August.

Often cultivated and frequently as escape in gardens, parks, forests, and in weedy places.—*European part:* Mainly in western and more southern regions; *Caucasus:* Rarely, mostly near large cities; *Eastern and Western Siberia:* More southern regions; *Far East:* Rarely in southern regions; *Soviet Central Asia:* Rarely, near large cities. *Gen-*

eral distribution: Western Europe, North America, South America (Chile), Northwest Asia; everywhere as an introduced or escaped plant. Described from Western Europe. Type in London.

Note. Apparently, it originated as a result of the prolonged cultivation of *P. parthenifolium* as an edging plant (where the inflorescences have no ornamental value) and is associated with it through "transitional" forms. However, there is no doubt about its close relationship with the wild species of the *P. grossheimii* type, in which ligulate florets often tend to disappear even in the wild state.

Economic Importance. Often cultivated as an ornamental border, mainly the variety with yellowish-green leaves—var. *aureum* hort. There are a few varieties with very finely divided leaves, for example, var. *laciniatum* hort. and var. *selaginoides* hort. However, the cultivated form with "double" capitula is also propagated for its flowers. The following forms or varieties differ in the degree of reduction of the ligulate florets: the typical one—var. *longiradiatum* Sch. Bip. (op. cit. 55) with strongly reduced ligulate florets—var. *breviradiatum* Sch.; Bip. (op. cit. 55); and entirely without ligulate florets—var. *flosculosum* DC. (op. cit. 58 = var. *discoideum* Sch. Bip. op. cit. 55). In more northern regions, it freezes in winter and behaves as an annual. It is used in folk medicine.

9. ***P. glanduliferum*** Somm. and Lev. Decas. Compos. nov. cauc. (1895) 87; Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 83; Grossh. Fl. Kavk. IV, 134 and Opred. Rast. Kavk. 460; Manden. in Fl. Gruzii, VIII, 367.—*P. buschianum* Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 90; Grossh. Fl. Kavk. IV, 137 and Opred. Rast. Kavk. 462; Manden. op. cit. 364.—**lc.:** Dechy, Kaukasus, III (1907) t. XXV (type specimen of species); Kolakovskii, Fl. Abkh. IV (1949) Plate XXIV.

206 Perennial. Plant 15–50 cm high, with shorter tap root, more or less puberulent, often subglabrous. Stem erect, densely leafy, more or less branched near base and above, less often simple. Leaves green or dull green from more dense pubescence, with numerous punctate-glandular hairs, all rather long-petiolate; lamina of lower and middle cauline leaves oblong to broadly ovate, pinnately cut almost to wingless rachis, with 5–9 segments, apical segments more or less connate at base, oblong, crenate or irregularly subacutely toothed or more or less pinnately lobed, sometimes partly pinnately parted, with more or less toothed lobes; upper cauline leaves strongly reduced and weakly divided. Capitula solitary or 2–15(20) on single stem, on rather long (up to 10–15 cm) peduncles in lax, sometimes irregular, corymbs. Involucre 9–16 mm in dia, 3–4 mm long, more or less pubescent to

glabrous; involucre bracts coriaceous-herbaceous, outer lanceolate or narrow-lanceolate, almost lacking border, inner 1.5, less often 2 times as long, linear and oblong-linear; with narrow light colored membranous border, more or less broadened at apex. Ligulate florets numerous, white, with corolla tube about 1.0–1.5 mm long, and limb 9–15 mm long; corolla of tubular florets 1.5–2.0 mm long. Achenes 1.4–1.8 mm long, about 0.5 mm wide, with 5–10 longitudinal ribs; corona 0.1–0.2 mm long, more or less irregularly obtusely toothed along margin. Flowering July to September.

In meadows, on stony slopes, rocks at 1,500–3,000 m.—*Caucasus*: Ciscaucasia, Western Transcaucasia. Endemic. Described from Glavny [Main] Caucasus Range. Type in Florence.

Note. It is a very closely related and a more high-mountain race in relation to *P. parthenifolium* with which it is linked through quite numerous transitional forms.

Apparently, the species *P. glanduliferum* and *P. buschianum* should be considered full synonyms. The characters, by which they have usually been distinguished (degree of pubescence and number of capitula), do not exhibit any clear ecological or geographical adaptation in the extensive material.

10. ***P. grossheimii*** Sosn. in Beih. Bot. Centralbl. XLIV, 2 (1928) 243; Grossh. Fl. Kavk. IV, 137 and Opred. Rast. Kavk. 461.—?*P. parthenifolium* var. *discoideum* Boiss. Fl. or. III (1875) 345.

207 Perennial. Plant 15–40 cm high, with shorter tap root, more or less pubescent to subglabrous. Stem erect or ascending at base, densely leafy, branched usually at base and above middle. Leaves green, rather thin, less often pubescent, with numerous punctate-glandular hairs, all rather long-petiolate; lamina of middle and lower cauline leaves more or less ovate, pinnately cut to almost wingless rachis, with 2–5 segments on each side, ovate to oblong, pinnately parted into more or less oblong, sometimes shallow-pinnately lobed lobes, on the average, broader than in *P. sevanense*. Capitula 5–20(30), on rather long (to 8 cm) slender peduncles, in lax corymbose-panicles. Involucre 5.0–7.5 mm in dia, 2.5–3.0 mm long, less often pubescent; involucre bracts coriaceous-herbaceous, outer narrow-lanceolate, almost lacking border, inner 1.5, less often 2 times as long, linear or oblong linear, with narrow but apically somewhat broadened membranous border. Ligulate florets 1–15, sometimes entirely lacking, white, with corolla tube about 1 mm long and limb 4.0–5.5 mm long; corolla of tubular florets 1.2–1.5 mm long. Achenes 1–1.3 mm long, about 0.4 mm wide, with 5–10 longitudinal ribs; corona about 0.1 mm long, subobtusely toothed along margin. Flowering May to June.

Rocks, stony slopes to 2,000 m.—*Caucasus*: Southern Transcaucasia (Nakhichevan ASSR); *Soviet Central Asia*: mountainous Turkmenia (rarely). *General distribution*: Armenia-Kurdistan, Iran (northern part). Described from the Nakhichevan ASSR. Type in Tbilisi.

Note. In the shape of the leaves, it occupies a somewhat intermediate position between *P. sevanense* and *P. parthenifolium*, but in the structure of the capitula it is close to *P. parthenium*.

11. ***P. sevanense*** Sosn. in Grossh. Fl. Kavk. IV (1934) 317 and Opređ. Rast. Kavk. 462.—*P. palmatum* (Vent.?) C. Koch in Linnaea, XXIV (1851) 331, sphalm. (= *Chrysanthemum praealtum* Vent.).—*P. parthenifolium* var. *canescens* Boiss. Fl. or. III (1875) 344 p. p.—*P. parthenifolium* f. *divaricata* Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 36.—*P. parthenifolium* var. *sevangensis* Sosn. in Grossh. in Zhurn. Russk. Bot. Obshch. XIV, 3 (1930) 314.—*P. niveum* var. *divaricatum* (Sosn.) Sosn. in Grossh. Fl. Kavk. IV (1934) 137.—*P. divaricatum* (Sosn.) Sosn. in Zam. po Sist. i Geogr. Rast. Bot. Inst. Akad. Nauk Gruz. SSR, XV (1949) 5; Manden. in Fl. Gruzii, VIII (1952) 364.—? *Chrysanthemum praealtum* Vent. Hort. Cels. (1800) 43, t. 43.

208 Perennial. Plant 15–60 cm high, with shorter tap root, more or less puberulent. Stem erect or ascending at base, densely leafy, more or less branched at base and above middle. Leaves dull green from rather dense pubescence; less often subglabrous above, with numerous punctate-glandular hairs, all rather long-petiolate; basal and lower cauline leaves up to 15(20) cm long, 4 cm wide; lamina of lower and middle cauline leaves more or less ovate, pinnately cut to almost wingless rachis; leaf segments 2–5 on each side, ovate to oblong-ovate, pinnately parted up to narrow-winged axis in more or less oblong lobes, often in turn pinnatilobate or pinnatipartite; apical lobes ovate to oblong, obtuse or subobtuse; upper cauline leaves strongly reduced and weakly divided. Capitula (1)5–20(30), on rather long (up to 8–10 cm) peduncles, aggregated in lax corymbose-racemes or corymbose-panicles. Involucre 7–10 mm in dia, 3.0–4.5 mm long, more or less pubescent; involucre bracts coriaceous-herbaceous, outer few, narrow-lanceolate, inner 1.5, less often almost 2 times as long, linear or oblong-linear, with narrow but apically more or less broadened, light-colored, membranous border. Ligulate florets numerous, white, with corolla tube 1.0–1.2 mm long, and limb; 7–10 mm long; corolla of tubular florets 1.4–1.8 mm long. Achenes 1.0–1.5 mm long, about 0.3–0.4 mm wide with 5–10 longitudinal ribs and more or less subobtusely irregularly toothed 0.1–0.3 mm long corona, usually reduced in ligulate florets. Flowering June to August.

Stony slopes, rocks at altitudes up to 2,500 m.—*Caucasus*: Eastern Transcaucasia, Southern Transcaucasia, Dagestan (southern part); *Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Armenia-Kurdistan, Iran (northwestern part). Described from vicinity of Lake Sevan in the Armenian SSR. Type in Tbilisi.

Note. It is very probable that the priority name of this species is *Pyrethrum praealtum* (Vent.) Tzvel. comb. nova (= *Chrysanthemum praealtum* Vent. l. c.). This latter species was described from garden specimens from northern Iran and, like *P. sevanense*, differs from *P. parthenifolium* by a very strong division of the leaves. It is to this species that Koch (l. c.) referred his specimens from Armenia, which undoubtedly belong to *P. sevanense* (the species was named by him not “*praealtum*” but “*palmatum*” only as the result of a printing error). However, the specimen of *C. praealtum* Vent. illustrated by the author of this species as though it were the type, has broader leaf lobes in comparison with the Caucasian specimens (possibly, as a result of cultivation?). Hence, so far it has not been possible to establish its complete identity with *P. sevanense*. There is hardly any justification for separating the form described from Aragats Mountains, which differs only on the average from *P. sevanense* by larger capitula on longer peduncles, as an independent ecogeographical race. The Dagestan specimens of *P. divaricatum* are somewhat more distinct from *P. sevanense*, which are quite close to *P. glanduliferum*, but differ from the former species by smaller capitula and the shape of the leaves. Most recently, they have been separated by Mandenova as an independent species: *P. demetrii* Manden. [*Zam. po Sist. i Geogr. Rast. Bot. Inst. Akad. Nauk Gruz. SSR*, XXII (1961) 60]. The type of this species: Dagestan, source of Avarian Koisu, Barbar Mountain, shale screes, A. Dolukhanova. 7.VIII.1937. *P. divaricatum* var. *monocephala* (Sosn.) Sosn. l. c. (1949) 6 = *P. parthenifolium* f. *monocephala* Sosn., 209 established by D.I. Sosnowsky [in *Tr. Tifl. Bot. Sada*, XVII (1915) 35] with solitary capitula, in my view has no taxonomic significance.

12. *P. fruticulosum* Biehl. Pl. nov. herb. Spreng. (1807) 37.—*P. niveum* Lag. Elench. hort. Madrit. (1805?) nom. nud. and Gen. et sp. nov. (1816) 30; DC. Prodr. VI, 57; Ldb. Fl. Ross. II, 552; Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 93; Grossh. Fl. Kavk. IV, 137 and Opred. Rast. Kavk. 462; Manden. in Fl. Gruzii, VIII, 367.—*P. argenteum* Adam ex Hoffm. Hort. Mosq. (1808) 34, nom. nud. non Boiss. 1875.—*P. pulverulentum* Willd. Enum. hort. Berol. II (1809) 906, non Lag. 1805.—*P. parthenifolium* var. *pulverulenta* (Willd.) Karel. in Bull. Soc. Nat. Mosc. XII (1839) 158.—*P. parthenifolium* var. *canescens* Boiss. Fl. or. III (1875) 344 p. p.—*Matricaria*

pulverulenta (Willd.) Poir. in Lam. Encycl. meth. Suppl. III (1814) 605.—*Tanacetum niveum* (Lag.) Sch. Bip. Tanacet. (1844) 56.

Perennial. Plant 15–60 cm high, with rather short tap root, more or less canescent. Stem erect or ascending near base, densely leafy, more or less branched mainly near base and above middle. Leaves as in previous species, but more or less canescent. Capitula (1)5–20(30), on rather long (to 10 cm) peduncles, in lax corymbs or corymbose-panicles. Involucre 7–10 mm in dia and 3.0–4.5 mm long, more or less pubescent; involucre bracts coriaceous-herbaceous, outer narrow-lanceolate, inner 1.5, less often almost 2 times as long, linear or oblong-linear, with narrow but apically more or less broadened, light colored, membranous border. Ligulate florets numerous, white, with corolla tube 1.0–1.2 mm long and limb 7–10 mm long; corolla of tubular florets 1.4–1.8 mm long. Achenes 1.0–1.5 mm long and about 0.3–0.4 mm wide, with 5–10 longitudinal ribs and more or less irregularly toothed 0.1–0.3 mm long corona, more or less reduced in ligulate florets. Flowering June to August.

On stony slopes, rocks at 1,000–2,500 m.—*Caucasus*: Ciscaucasia (eastern part), Dagestan, Eastern Transcaucasia, Western Transcaucasia (southern part?), Southern Transcaucasia (Aragats Mountain), Talysh. *General distribution*: Armenia-Kurdistan. Described from Caucasus. Type in Halle (Germany).

Note. This species is very close to the previous one and related to it through transitional forms, but, apparently, all the same, forming a distinct ecogeographical race, adapted mainly to northeastern part of the Lesser Caucasus and eastern part of the Greater Caucasus. A few specimens from the Adzharo-Imeretia Range, possibly, belong to a separate broader-leaved race closer to *P. kubense*.

13. ***P. kubense*** Grossh. in Tr. Azerb. Otd. Zakavk. Fil. Akad. Nauk SSSR, Sek. Bot. 1 (1933) 58; Grossh. Fl. Kavk. IV, 137 and Oprod. Rast. Kavk. 462.

210 Perennial. Plant 20–70 cm high, with rather short tap root, canescent (almost tomentose). Stem erect or ascending at base, densely leafy, usually branched near base and above middle. Leaves canescent, with indistinct punctate-glandular hairs, all rather long-petiolate; lamina of lower and middle cauline leaves ovate or oblong-ovate, pinnately cut almost to wingless rachis; leaf segments 2–5 on each side, oblong to ovate, pinnatilobate or pinnatipartite; lobes and segments oblong-ovate to almost semicircular, obtuse or subobtuse, sometimes crenate or shallow-lobed; upper cauline leaves reduced, weakly divided. Capitula (1)5–15(25), on long (to 15 cm) peduncles, in lax corymbose-racemes or corymbose-panicles. Involucre 9–11 mm in dia, 3.5–4.5 mm long,

more or less sparsely tomentose; involuclral bracts coriaceous-herbaceous, outer narrow-lanceolate, almost lacking border, inner linear or oblong-linear, with narrow but apically more or less broadened light-colored, membranous border. Ligulate florets numerous, white, with corolla tube about 1 mm long, and limb 7–10 mm long; corolla of tubular florets 1.5–2.0 mm long. Achenes 1.2–1.8 mm long, about 0.5 mm wide, with 5–10 longitudinal ribs and more or less irregularly toothed 0.1–0.2 mm long corona. Flowering June to August.

Rocks, stony slopes in upper mountain zone.—*Caucasus*: Dagestan (southern part), Eastern Transcaucasia (northeastern part), Talysh (reported by Grossheim). Endemic. Described from Kuba District of Azerbaidzhan SSR. Type in Baku.

Note. Related to the previous species through transitional forms but, all the same, apparently forming a unique ecogeographical race differing from *P. fruticulosum* mainly by broader leaf lobes and a denser pubescence.

Section 4. *Leptanthemum* Tzvel. sect. nova in Addenda, XXV, 871.—Plants herbaceous, 15–50 cm high, usually covered with appressed bifid and simple hairs, usually mixed with shorter glandular hairs, with less densely leafy stem and well developed, short, nonflowering shoots. Leaves twice pinnately cut. Capitula usually rather numerous, (1)4–25(40), in very lax corymbose or corymbose-paniculate inflorescence. Involucre patelliform, 6–11 mm in dia; outer involuclral bracts 1/2–2/3, as long as inner. Receptacle weakly convex, almost flat. Corolla limb in ligulate florets broadly oval, 5–7 mm long; corolla of tubular florets 2.2–2.6 mm long, with weakly and gradually broadened tube in upper half and deltoid, weakly recurved teeth.

211 Achenes 1.5–2.0 mm long, with (4)5(7) longitudinal ribs, in ligulate florets shifted ventrally; corona about 0.2 mm long, usually irregularly crenate or lobate up to middle.

A monotypic section.

Note. The only species of this section occupies a distinct position in the genus and shows some resemblance to the species of the two previous sections in capitulum structure. Its strong and, apparently, not incidental resemblance to the species of section *Tanacetopsis* Tzvel. of the genus *Cancrinia* Kar. and Kir. should also be noted.

14. ***P. leptophyllum*** Stev. in MB. Fl. taur.-cauc. III (1819) 580; DC. Prodr. VI, 60; Ldb., Fl. Ross. II, 553; Boiss. Fl. or. III, 341; Sosn. in Tr. Tifl. Bot. Sada, XVII, 20; Grossh. Fl. Kavk. IV, 136 and Opred. Rast. Kavk. 461.—*Tanacetum leptophyllum* (Stev.) Sch. Bip. Tanacet. (1844) 48.

Perennial. Plant 15–50 cm high, with creeping, more or less branched rhizome, usually covered with adherent bifid and appressed hairs, together with short glandular hairs. Stem erect, less densely leafy, strongly branched from middle or slightly lower. Leaves usually dull green from sparse (sometimes weak) pubescence, with numerous, but not always conspicuous, punctate-glandular hairs; basal leaves up to 15–20 cm long and 3 mm wide, on long, basally thickened petiole, with twice or thrice pinnately cut, oblong or broad linear lamina; apical lobes and segments broadly lanceolate to almost semicircular, to 1 mm wide, with short cartilaginous cusp; cauline leaves reduced, lower short-petiolate, upper sessile. Capitula (1)4–25(40) on 1.5–15.0 cm long peduncles, in very lax, broadly spreading, corymbs or corymbose-panicles. Involucre 6–11 mm in dia, 3–4 mm long, more or less pubescent or glabrous; involucre bracts coriaceous-herbaceous, outer narrow-lanceolate, usually lacking border, inner 1.5, less often 2 times as long, linear-oblong, in upper part with narrow but apically appendiculately broadened light colored or brownish membranous border. Ligulate florets white, with strongly compressed corolla tube 1.0–1.5 mm long, and limb 5–7 mm long; corolla of tubular florets 2.2–2.6 mm long. Achenes 1.5–2.0 mm long and 0.5–0.6 mm wide, usually with 5 longitudinal ribs and irregularly crenate or lobate, about 0.2 mm long corona. Flowering July to August. (Plate VIII, Fig. 1.)

Stony slopes, screes, rocks at altitudes up to 2,500 m.—*Caucasus*: Dagestan, Eastern Transcaucasia (northern part and Shakhdag Range). Endemic. Described from southern Dagestan. Type in Helsinki; isotype in Leningrad.

- 212 **Section 5. *Balsamitopsis*** Tzvel. sect. nova in Addenda, XXV, 871.—Plants herbaceous, 30–70 cm high, densely covered with strongly flattened, appressed, bifid hairs, with weakly leafy stem and well developed, short, nonflowering shoots. Basal leaves entire, cauline lyrate to pinnately parted; all leaves more or less long-petiolate. Capitula solitary or 2–6 on single stem, and then aggregated in lax corymbose-racemes. Involucre narrow-patelliform, 8–15 mm in dia. Receptacle weakly convex, almost flat. Corolla limb in ligulate florets oblong-linear, 9–17 mm long; corolla of tubular florets about 2.5 mm long. Achenes 2.5–2.8 mm long with 5–8 longitudinal ribs; corona 0.3–0.4 mm long, irregularly crenate.

A monotypic section.

Note. The only species of the section, known so far only from a single locality (“Mramornaya Mountain”), does not show a clear affinity with any of the known species from Soviet Central Asia and China. Very likely it is closest to the species of section *Balsamita* (Mill.) DC.

However, considering the large disjunction in their ranges and a series of significant morphological differences, I prefer to include it under a separate monotypic section.

15. **P. kelleri** (Kryl. and Plotn.) Krasch. in Kryl. Fl. Zap. Sib. XI (1949) 2749.—*Chrysanthemum kelleri* Kryl. and Plotn. in Sb. "Dvadtsat' Pyat' Let Nauchno-Pedag. i Obshch. Deyat. B.A. Kellera"* (1931) 3.

Perennial. Plants 40–70 cm high, with creeping, more or less branched rhizome, densely covered with strongly flattened, bifid hairs. Stems solitary or few, erect or ascending at base, sparsely leafy, simple or more or less branched above. Young leaves silver-grayish from dense pubescence, older dull green, slightly sericeous, with inconspicuous, punctate glandular hairs; basal leaves 20–25 cm long, 6–7 cm wide, on long (usually several times as long as lamina) petioles, with entire obovate or rotund-elliptical lamina, broadly cuneate at base, irregularly crenate along margin and near obtuse apex; cauline leaves few (3–7), short-petiolate, with lyrate-pinnatisect lamina to 4 cm wide; apical lobe large, broadly oval, crenate, lateral lobes small, 1–4 on each side. Capitula solitary or 2–6 on single stem, on to 20 cm-long peduncles, in lax corymbose-racemes. Involucre 8–15 mm in dia, glabrous; outer involucre bracts lanceolate, inner oblong-obovate, mainly in upper part with narrow, apically more or less broadened, light-colored, membranous border. Ligulate florets white, limb 9–17 mm long and 3.0–3.5 mm wide. Achenes 2.5–2.8 mm long, 1 mm
213 wide, with 5–8 longitudinal ribs and crenate, 0.3–0.4 mm long corona. Flowering June to July.

Dry stony slopes in lower mountain zone (at altitudes of about 1,000 m).—*Western Siberia*: Altai (southern part: Mramornaya Mountain). Endemic. Described from Altai. Type in Tomsk.

Note. Unfortunately, I did not see the flowering specimens of this unique species preserved in Tomsk.

Section 6. Cinerariifolia (Heyw.) Tzvel. comb. nova.—*Tanacetum* sect. *Pyrethrum* subsect. *Cinerariifolia* Heywood in Anal. Inst. Bot. Cavanill. Madrid, XII, 2 (1953) 325.—Plants herbaceous, 15–45 cm high, densely covered with strongly flattened appressed, bifid hairs, with more sparsely leafy stems and well developed, short, nonflowering shoots. Leaves more or less pinnately cut, all usually long-petiolate. Capitula solitary or 2–6 on single stem, and then aggregated in very

*"Twenty-five years of Scientific Pedagogic and Social Activity of B.A. Keller"—Translator.

lax and irregular corymbs. Involucre 12–18 mm long, narrow-patelliform; outer involucre bracts a half to two-thirds as long as inner. Receptacle weakly pubescent; corolla limb of ligulate florets oblong or oblong-linear, 8–16 mm long; corolla of tubular florets 2.5–3.0 mm-long, with tube slightly broadened in upper half and deltoid, weakly recurved teeth. Achenes 2.5–3.2 mm long, with 5–7 longitudinal ribs, in ligulate florets more or less shifted ventrally; corona 0.6–1.0 mm long, finely and irregularly toothed along margin.

Type of section: *Pyrethrum cinerariifolium* Trev.

Note. A section of relatively few species that are adapted to the Mediterranean mountain regions.

16. **P. cinerariifolium** Trev. Ind. Sem. Hort. Vratisl. App. II (1820) 2 and in Nov. Act. Nat. Cur. XIII (1826) 204; DC. Prodr. VI, 55; Grossh. Opred. Rast. Kavk. 461; Stankov in Stank. and Tal. Opred. Rast. Evrop. Ch. SSSR, 631; Klok. in Vizn. Rosl. URSR, 539.—*Chrysanthemum turreanum* Vis. Strip. Dalm. (1826) 19.—*C. cinerariifolium* (Trev.) Vis. Fl. Dalm. II (1847) 88, t. 8.—*Tanacetum cinerariifolium* (Trev.) Sch. Bip. Tanacet. (1844) 58.—**lc.**: Vis. op. cit.; Rchb. Ic. Fl. Germ. XVI (1854) t. 993; Hegi, Ill. Fl. VI, 2, f. 312; Jav. and Csap. Ic. Fl. Hung. 524; Zemlinskii, Lekarstv. Rast. SSSR, ed. 2, 230 and 231.—**Exs.**: Fl. Ital. exs. No. 179; Fl. exs. Austro-Hung. No. 239.

214 Perennial. Plants 15–45 cm high, with short inclined rhizome, silvery grayish from dense pubescence of strongly flattened, appressed, bifid hairs; stems solitary or few, erect, more sparsely leafy, simple or more or less branched (almost from base). Leaves silver-grayish from dense pubescence, with numerous punctate-glandular hairs; basal leaves to 10(20) cm long, long-petiolate, petioles sometimes exceeding lamina; lamina ovate or oblong, pinnately cut up to usually wingless rachis into cuneate segments near base, in turn pinnately or palmately parted; apical segments and lobes linear to oblong-ovate, subobtuse or subacute; cauline leaves smaller and weakly divided, short-petiolate. Capitula solitary or 2–6 on single stem, and then aggregated in lax and irregular corymbs. Involucre 12–18 mm in dia, 6–7 mm long, more or less appressed-hairy; involucre bracts coriaceous-herbaceous, outer broad lanceolate, subacute, lacking border, inner 1.5–2 times as long, oblong-linear, with rather wide, light-colored, membranous border, appendiculately broadened at apex. Ligulate florets white, with corolla tube about 1.5 mm long and limb 8–16 mm long; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.5–3.2 mm long and 0.7–1.0 mm wide, with 5–7 longitudinal ribs and 0.6–1.0 mm long finely toothed corona. Flowering June to August.

Cultivated as a medicinal (insecticidal) plant, occasionally found as introduced or escaped plant.—*European part*: Southern regions; *Caucasus*; *Soviet Central Asia*. *General distribution*: Balkan Peninsula (Yugoslavia, Albania, Greece). Described from Yugoslavia. Type in Bonn or Bratislava.

Economic Importance. It contains a high percentage of the complex ester, pyrethrin, which forms the base for the "pyrethrum" insecticide preparations used as solutions, powders, emulsions, etc. The species has long been cultivated in many countries. Details about its cultivation and uses can be found in the above cited book of Zemlinsky (pp. 230–232), as well as in many brochures and articles by other authors.

Section 7. *Pyrethrellum* Tzvel. sect. nova in Addenda, XXV, 872.—Plants herbaceous, 5–80 cm high, sometimes covered with short bifid and simple or only simple hairs, usually more or less glabrous, with more sparsely leafy stem and not always developed, short, nonflowering shoots. Leaves more or less pinnately cut, lower petiolate, upper sessile or short-petiolate. Capitula solitary, less often 2–10(40) on single stem and then in very lax, irregular, corymbs. Involucre narrow-patelliform, 8–20 mm in dia; outer involucre bracts not less than $\frac{2}{3}$ as long as inner. Receptacle usually strongly convex, hemispherical, less often (in *P. silaifolium*) weakly convex. Limb of ligulate florets oblong to linear, 7–25 mm long; corolla of tubular florets 2.2–3.2 mm long, with slightly weakly and gradually broadened tube in upper half and deltoid or lanceolate-deltoid, weakly recurved teeth. Achenes 1.8–3.2 mm long, with 5–8 longitudinal ribs, more or less shifted ventrally in ligulate florets; corona 0.1–0.5 mm long, less
215 often (*P. komarovii*) 0.5–1.3 mm long, usually irregularly toothed or lobed to middle, less often almost to base.

Type of section: *Pyrethrum coccineum* (Willd.) Worosch.

Note. This Caucasian and northwest Asian section, closely related to the previous section, shows some affinity, on the one hand, with the species of section *Parthenium* through *P. punctatum*, and, on the other, with some species of section *Richteria* (especially *P. pulchellum*) and the genus *Tripleurospermum* Sch. Bip. through *P. daghestanicum* and *P. tricholobum*. The generic affinity of *P. tricholobum* and *P. komarovii*, morphologically very similar to the perennial Caucasian species of the genus *Tripleurospermum*, cannot at present be established definitely due to the absence of mature achenes. I have included both these species (following Sosnowsky) in the genus *Pyrethrum* (section *Pyrethrellum*) only on the basis of secondary, often insignificant characters, and to a great extent only tentatively.

Series 1. Stoloniifera Sosn. in Tr. Tifl. Bot. Sada, XVII (1915)

27.—Plants with rooting stoloniferous branches, glabrous or with isolated, simple papilliform hairs; stems densely leafy; leaves pinnately parted, with broad apical lobes; receptacle strongly convex; ligulate florets white; corona of achenes about 0.3 mm long.

17. **P. punctatum** (Desr.) Bordz. ex Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 83; Grossh. Fl. Kavk. IV, 134 and Opred. Rast. Kavk. 460; Manden. in Fl. Gruzii, VIII, 356.—*P. palustre* Willd. Sp. pl. III (1803) 2154; DC. Prodr. VI, 54; Boiss. Fl. or. III, 341; Sosn. in Tr. Tifl. Bot. Sada, XVII, 27.—*P. jacobaeiforme* C. Koch, in Linnaea, XXIV (1851) 331.—*P. lilae* Bordz. in Prot. Sobr. Kievsk. Obshch. Estestv. 3, XI (1907) 27 and Fl. cauc. exs. No. 196.—*Matricaria punctata* Desr. in Lam. Encycl. III (1792) 732.—*Chrysanthemum palustre* (Willd.) Pers. Pers. Syn. pl. II (1807) 461.—*C. punctatum* (Desr.) Bordz. in Zap. Kievsk. Obshch. Estestv. XXV (1915) 122.—*Tanacetum palustre* (Willd.) Sch. Bip. Tanacet. (1844) 49.—**Exs.**: Pl. or. exs. No. 172; Fl. cauc. exs. No. 196; Herb. Fl. Cauc. fasc. XI, No. 54.

Perennial. Plants 20–80 cm high, with short inclined rhizome and rooting stoloniferous shoots, glabrous or with isolated, simple, papilliform hairs. Stem erect, densely leafy, ribbed, simple or more or less branched above (sometimes almost from base). Leaves glabrous or subglabrous; with numerous punctate-glandular hairs; basal and lower cauline leaves withering early, rather long-petiolate; middle cauline leaves to 10(14) cm long, 3(5) cm wide, sessile, oblong to oblong-linear, pinnately parted up to narrow-winged rachis, with 4–11 lobes on each side, usually narrowed toward base, oblong or oblong-linear, 216 3–10 mm wide, with large teeth or shallow-lobate along margin, with short cartilaginous cusp. Capitula solitary or 2–20(40), on long (to 6 cm long), often leafy peduncles, in lax corymbs or corymbose-panicles. Involucre 11–16 mm in dia, 4–6 mm long, glabrous or subglabrous; involucre bracts herbaceous, outer lanceolate, inner 1.5, rarely less often 2 times as long, oblong-linear; all bracts with rather wide, dark brown or brownish membranous border, modified in inner bracts in light colored, lacerate-fimbriate appendage at apex. Ligulate florets white, with corolla tube 1.5–2.0 mm long, and limb 8–15 mm long; corolla of tubular florets 2.0–2.5 mm long. Achenes 2.0–2.5 mm long, 0.7–0.8 mm wide, with 5–8 longitudinal ribs and about 0.3 mm long subobtusate or lobed corona. Flowering June to August.

Marshes, marshy meadows at altitudes from 1,000 to 3,500 m.—**Caucasus**: Eastern Transcaucasia (southwestern part), Western

Transcaucasia (southern part), Southern Transcaucasia. *General distribution*: Armenia-Kurdistan. Described from Turkey. Type in Paris.

Note. A highly polymorphic species, possibly comprising several ecogeographical races.

Series 2. *Marionia* Tzvel.—Plants with weakly developed short nonflowering shoots, subglabrous (with very short, papilliform, simple hairs); stems more densely leafy; leaves pinnately parted, with broad apical lobes; receptacle strongly convex; ligulate florets white; corona of achenes 0.2–0.3 mm long.

18. ***P. marionii*** Albov in Bull. Herb. Boiss. III (1895) 92; Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 26; Grossh. Fl. Kavk. IV, 134 and Opred. Rast. Kavk. 460; Manden. in Fl. Gruzii, VIII, 355, Plate 394.—**Ic.**: Kolakovskii, Fl. Abkh. IV (1949) Plate 23; Manden. op. cit.

Perennial. Plants 20–70 cm high, with more or less branched inclined rhizome, more or less covered with very short, papilliform, simple hairs, usually subglabrous. Stem erect or ascending at base, sparsely leafy, simple or with few lateral branches from middle. Leaves subglabrous, usually puberulent beneath, with numerous punctate-glandular hairs; basal and lower cauline leaves to 20(25) cm long, 6(8) cm wide, on rather long, basally thickened petiole; lamina oblong or linear-oblong, relatively flat, pinnately parted up to narrow-winged rachis; segments 4–7 on each side, usually narrowed toward base, oblong to oblong-linear, pinnately lobed and irregularly sharply toothed; apical lobes semirotund-deltoid to broadly lanceolate, 2–5 mm wide; cauline leaves smaller, lower short-petiolate, upper sessile or subsessile, 217 weakly divided. Capitula solitary, less often 2–5 on single stem, forming lax irregular corymbs. Involucre 14–19 mm in dia, 6.0–7.5 mm long, slightly pubescent; involucre bracts coriaceous-herbaceous, outer broadly lanceolate, subobtus, inner 1.5–2 times as long, linear-oblong; all bracts with rather wide, dark brown, membranous border, apically more or less appendiculately broadened in inner bracts. Ligulate florets white, with corolla tube 1.6–2.0 mm long and limb 8–15 mm long; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.0–2.6 mm long, about 0.6 mm wide, with 5–8 longitudinal ribs; corona 0.2–0.3 mm long, toothed or irregularly lobed to middle or almost to base, strongly reduced dorsally in ligulate florets. Flowering July to August.

Limestone rocks, stony slopes, grassy areas at altitudes of 1500–2500 m.—*Caucasus*: Western Transcaucasia (Abkhazian ASSR). Endemic. Described from Abkhazian ASSR. Type in Leningrad.

Series 3. Rosea Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 21.—Plants not always with developed short, nonflowering shoots, more or less covered with short bifid and simple hairs, often subglabrous; stems usually weakly leafy; leaves once or twice pinnately cut; receptacle strongly convex; ligulate florets pink, of various shades; corona of achenes 0.1–0.2 mm long.

19. **P. roseum** (Adam) MB. Fl. taur.-cauc. II (1808) 324 and III (1819) 578, quoad nomen.—*P. carneum* MB. ibid. II (1808) 325 and III (1819) 578; DC. Prodr. VI, 55; Ldb. Fl. Ross. II, 550; Boiss. Fl. or. III, 340; Sosn. in Tr. Tifl. Bot. Sada, XXVII, 25; Grossh. Fl. Kavk. IV, 133 and Oprod. Rast. Kavk. 460; Manden. Fl. Gruzii, VIII, 355.—*P. roseum* var. *carneum* (MB.) Trautv. in Tr. Peterb. Bot. Sada, V, 2 (1878) 443.—*Chrysanthemum coronopifolium* Willd. Sp. pl. III (1803) 2145, non Vill. 1785.—*C. roseum* Adam in Web. and Mohr. Beitr. I (1805) 70.—*C. carneum* (MB.) Steud. Nomencl. (1821) 192; Parsa, Fl. Iran. III (1949) 267.—*C. roseum* var. *carneum* (MB.) Schmalh. Fl. II (1897) 70.—*Tanacetum roseum* (Adam) Sch. Bip. Tanacet. (1844) 58, quoad nomen.—*T. carneum* (MB.) Sch. Bip. ibid. 58.—Exs.: GRF No. 774.

Perennial. Plants 20–60 cm high, with more or less branched, inclined rhizome, usually covered with semi-erect bifid and simple hairs, often subglabrous. Stem erect or ascending at base, sparsely leafy, simple, less often with 1–2 lateral branches. Leaves usually subglabrous, lacking distinct punctate-glandular hairs; basal and lower cauline leaves up to 15 cm long and 4 cm wide, rather long-petiolate, with oblong or linear-oblong, pinnately cut lamina, segments 3–7 on each side, oblong or linear-oblong, irregularly bidentate or pinnately lobed, up to 5–7 mm wide, terminal lobes more or less toothed; middle and upper cauline leaves small, sessile or subsessile, usually pinnatisect, with more or less toothed segments. Capitula solitary, less often 2–3, on long peduncles often leafy in lower part. Involucre 12–20 mm in dia, 4–6 mm long, more or less appressed-hairy to subglabrous; involucre bracts herbaceous, outer linear-lanceolate, subobtusate, inner not more than 1.5 times as long, oblong-linear; all bracts with quite broad dark brown or brownish membranous border, somewhat broader at apices of inner bracts. Ligulate florets in various shades of pink, with corolla tube 1.2–2 mm long and limb 12–25 mm long; corolla of tubular florets 2.6–3.2 mm long. Achenes 2.2–3.2 mm long, with 5–8 longitudinal ribs; corona 0.1–0.2 mm long, irregularly blunt-toothed. Flowering June to August.

Meadows, stony slopes at altitudes of 1,500–3,000 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern Transcaucasia, Western Transcaucasia (northern part, rarely). *General distribution*: Armenia-Kurdistan(?).

Described from Caucasus. Type in Leningrad.

Note. This species is widely known by the name *P. carneum* MB. However, it, also includes the type specimens of *Chrysanthemum roseum* Adam, a fact noted even by Ascherson [in Hoffman, *Nat. Pflanzenfam.* IV, 5 (1889) 278], who gave "*Pyrethrum roseum* MB". a new name—" *Chrysanthemum marschallii* Aschers". In the very short description given by Adam (l. c.), the segments of the leaves are reported as pinnatipartite. The type specimens of *Chrysanthemum roseum* Adam actually have somewhat more deeply divided leaf segments than in typical specimens of *Pyrethrum carneum* MB., but, nevertheless, their affinity to *Pyrethrum carneum* MB. and not to "*P. roseum* MB." is quite apparent. Adam's specimens are missing from the Herbarium of Marschall-Bieberstein, who, apparently, did not see them.

Economic Importance. Sometimes cultivated as an ornamental plant. There are several cultivars, which differ in the color of the ligulate florets and the capitulum size, including "double-flowered" cultivars with tubular florets, entirely or partly modified into ligulate florets. It contains a significant percentage of the insecticidal substance pyrethrin and is cultivated occasionally to obtain different insecticidal preparations ("Pyrethrum").

20. ***P. coccineum*** (Willd.) Worosch. in Spisok Sem. Gl. Bot. Sada Akad. Nauk SSSR, IX (1954) 21.—*P. raseum* auct.: MB. Fl. taur.-cauc. II (1808) 324 and III (1819) 578, quoad pl.; DC. Prodr. VI, 56; Ldb. Fl. Ross. II, 549; Sosn. in Tr. Tifl. Bot. Sada, XVII, 21, excl. var.; Grossh. Fl. Kavk. IV, 133 and Opred. Rast. Kavk. 460; Manden. in Fl. Gruzii, VIII, 352, non *Chrysanthemum roseum* Adam.—*P. roseum* var. *adami* Trautv. in Tr. Peterb. Bot. Sada, V, 2 (1878) 443.—*Chrysanthemum coccineum* Willd. Sp. pl. III (1803) 2144.—*C. marschallii* Aschers. in Hoffm. in Pflanzenfam. IV, 5 (1889) 278, nom. nov.—*C. roseum* auct. non Adam; Schmalh. Fl. II, 70, excl. var.—*Tanacetum roseum* (Adam) Sch. Bip. Tanacet. (1844) 58, quoad pl.—**Ic.**: MB. Cent. Pl. rar. ruth. I (1810) t. 34; Zemlinskii, Lekarstv. Rast. SSSR, ed. 2, 234.—**Exs.**: Pl. or. exs. No. 200.

Perennial. Plants 20–60 cm high, with more or less branched inclined rhizome, somewhat covered with semi-erect bifid and simple hairs, usually subglabrous. Stem erect or ascending at base, sparsely leafy (more weakly than in previous species), simple, very rarely with single lateral branch. Leaves like previous species, but more incised segments in lower cauline and basal leaves pinnately cut or parted, usually with pinnately parted or more or less lobate secondary lobes; segments of middle and upper cauline leaves usually also pinnately

parted. Capitula solitary, rarely in 2 on single stem, on long (up to 10–15 cm), more or less pubescent peduncles. Involucre 12–20 mm in dia, 4–6 mm long, more or less appressed-hairy to subglabrous; involucre bracts like previous species, but usually with broader, dark brown, membranous border. Ligulate florets in different shades of pink or red, with corolla tube 1.2–2.0 mm long and limb 12–25 mm long; corolla of tubular florets 2.6–3.2 mm long. Achenes 2.2–3.2 mm long with 5–8 longitudinal ribs and irregularly blunt-toothed, 0.1–0.2 mm long corona. Flowering June to August.

Meadows, stony slopes at altitudes of 1,500–3,000 m.—*Caucasus*: Ciscaucasia (rarely), Dagestan (rarely), Eastern, Western and Southern Transcaucasia (northern and western parts). *General distribution*: Armenia-Kurdistan. Described from Caucasus. Type in Berlin.

Note. A highly polymorphic species, possibly comprising several morphologically weakly separated local races, partly transitional to the previous species. The variety "*P. roseum* var. *album* Grossh." (*Fl. Kavk.* IV, 133) with white ligulate florets either belongs to one of the following species or was described on the basis of albino plants.

Economic Importance. Like the previous species, it sometimes is cultivated as an ornamental plant and has medicinal value (for preparing insecticides).

Series 4. *Daucifolia* Tzvel.—Plants with well developed, short, nonflowering shoots, more or less covered with short bifid and simple hairs, sometimes sub-glabrous. Stem sparsely leafy; leaves 1–2 pinnatisect, with broader terminal lobes; receptacle slightly convex; ligulate florets white; corona of achenes 0.1–0.3 mm long.

21. ***P. chamaemelifolium*** (Somm. and Lev.) Sosn. in Zam. po Sist. i Geogr. Rast. Bot. Inst. Akad. Nauk Gruz. SSR, XV (1949) 3, descr. emend.; Grossh. Opred. Rast. Kavk. 461; Manden. in Fl. Gruzii, VIII, 356.—*P. roseum* var. *chamaemelifolium* Somm. and Lev. in Tr. Peterb. Bot. Sada. XVI (1900) 235; Sosn. in Tr. Tifl. Bot. Sada, XVII, 220 25; Grossh. Fl. Kavk. IV, 133.—**!c.**: Manden. op. cit. Plate 395.

Perennial. Plants 20–50 cm high, with more or less branched rhizome, sparsely covered with semi-erect, bifid and simple hairs, often subglabrous. Stem erect or ascending at base, very sparsely leafy, simple. Leaves very rarely pubescent, mainly beneath, lacking distinct punctate-glandular hairs; basal and lower cauline leaves up to 20 cm long and 5 cm wide; on rather long (often exceeding lamina) petiole; lamina ovate to oblong, pinnately cut to almost wingless axis, with 3–7, sessile or short-petiolate, broadly ovate to oblong segments on each side, pinnately parted, with lobes 2–5-parted or pinnate; terminal

segments and lobes deltoid to lanceolate-linear, up to 2 mm wide, gradually narrowed at apex into rather long cartilaginous cusp; middle and upper cauline leaves strongly reduced, weakly divided, upper leaves usually sessile. Capitula solitary, on long (15–20 cm), more or less glabrous peduncles. Involucre 12–17 mm in dia, 4.5–6.0 mm long, only basally more or less appressed-hairy; involucre bracts herbaceous, outer lanceolate, subobtusate, inner 1.5, rarely 2 times as long, broadly linear; all bracts with brownish or dark brown membranous border, appendiculately broadened at apex in inner bracts. Ligulate florets white, with corolla tube 1.5–2.0 mm long and limb 10–18 mm long; corolla of tubular florets 2.4–3.2 mm long. Achenes 2.4–3.0 mm long with 8–10 longitudinal ribs and about 0.1–0.2 mm long finely toothed corona. Flowering June to July.

Rocks, stony slopes (especially on limestone deposits) in upper mountain zone.—*Caucasus*: Western Transcaucasia (northern part). Endemic. Described from Caucasus (Rioni River basin and its upper reaches). Type in Florence; isotype in Leningrad.

22. *P. silaifolium* Stev. in DC. Prodr. VI (1837) 57.—*P. roseum* var. *leucanthum* C.A.M. Verzeichn. (1831) 73; Boiss. Fl. or. III, 340.—*P. daucifolium* Stev. ex Karel. in Bull. Soc. Nat. Mosc. XII (1839) 158, nom. nud. non Ldb.—*P. daucifolium* (? Pers.) Ldb. Fl. Ross. II (1845–1846) 549 p. p.; Grossh. Opred. Rast. Kavk. 461.—*P. ceratophylloides* auct. non Ten.; C. Koch in Linnaea, XXIV (1851) 330.—*P. paucifolium* C.A.M. ex Trautv. in Tr. Peterb. Bot. Sada, VIII, 2 (1883) 456.—*P. meyerianum* Sosn. in Tr. po Geob. Obsl. Pastb. Azerb. Ser. A, VII (1931) 103–104 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 642; Grossh. Fl. Kavk. IV, 135.—*Tanacetum silaifolium* (Stev.) Sch. Bip. Tanacet. (1844) 61.—*Chaemaemelum silaifolium* (Stev.) Trautv. ex Grossh. Fl. Kavk. IV (1934) 128 and Opred. Rast. Kavk. 458.—*lc.*: Sosn. l. c. (1931) t. IX.

221 Perennial. Plants 10–40 cm high, with branched creeping rhizome, more or less covered with semi-erect bifid and simple hairs, often mixed with very short papilliform hairs. Stem erect or ascending at base, very sparsely leafy, simple or branched near middle, with 1–3 lateral branches. Leaves sparsely pubescent or glabrous, usually lacking distinct punctate-glandular hairs; basal and lower cauline leaves up to 10 cm long and 2 cm wide, on long (often as long as lamina) petiole; lamina oblong, pinnately cut up to wingless axis; segments 4–8 on each side, short-petiolate or subsessile, broadly ovate to oblong, 1–2 pinnately parted or almost 3–7 palmately parted; terminal segments or lobes broadly lanceolate to almost deltoid, up to 22 mm wide, narrowed into rather long cartilaginous cusp; remaining cauline leaves strongly

reduced, usually all short-petiolate. Capitula solitary or 2–4 on each stem, on very long (up to 25 cm long) slender peduncles. Involucre 10–13 mm in dia and 4.0–5.5 mm long, more or less pubescent; involucre bracts herbaceous, outer lanceolate or ovate-lanceolate, inner not more than 1.5 times as long, oblong; all bracts with rather broad, brownish, less often light colored, membranous border, appendiculately broadened at apex of inner bracts. Ligulate florets white, with corolla tube 1.0–1.5 mm long and limb 7–13 mm long; corolla of tubular florets 2.2–3.0 mm long. Achenes 2.0–2.5 mm long with 5–8 longitudinal ribs and 0.2–0.3 mm long irregularly toothed corona. Flowering June to August.

Shale screes, stony slopes, usually at altitudes of 1,000–2,500 m.—*Caucasus*: Dagestan (southern part), Eastern Transcaucasia (northern part), Talysh (?). Endemic. Described from eastern part of Main Caucasian Range. Type in Helsinki; isotype in Leningrad.

Note. A very close ecogeographical race of this series—*P. daucifolium* (Pers.) Ldb. [Ldb. op. cit. 549 = *Chrysanthemum daucifolium* (Pers.) Syn. pl. II (1807) 462]—with larger (on the average) capitula and a darker and broader membranous border of the involucre bracts is found in the mountains of northern Iran (and, possibly, also Talysh). However, I am not completely sure that this is actually *Chrysanthemum daucifolium* Pers., described on the basis of garden plants of unknown origin, and in this respect I must rely exclusively on the authority of Ledebour. *P. silaifolium* was initially reported by Steven under the name “*P. daucifolium* Stev.” (probably, independently of *Chrysanthemum daucifolium* Pers.), but later was renamed with its present name. *P. paucifolium* C.A.M. and *P. meyerianum* Sosn., described later from Meyer’s specimens, from the Eastern Caucasus are undoubtedly synonyms of this species.

- 222 **Series 5. Daghestanica** Tzvel.—Plants with well developed, short, nonflowering shoots, usually covered with short simple hairs; stems sparsely leafy; leaves pinnatisect, with rather narrow terminal lobes; receptacle strongly convex; ligulate florets white; corona of achenes 0.3–0.5 mm long.

23. ***P. daghestanicum*** (Rupr. ex Boiss.) Rupr. ex Flerov. Spisok. Rast. Sev. Kavk. (1938) 563; Sosn. and Manden. in Bot. Zhurn-SSSR. XXXIV, 3 (1949) 288.—*Chamaemelum daghestanicum* (Rupr. ex Boiss.) Boiss. Fl. or III (1875) 334, excl. var.; Grossh. Fl. Kavk. IV, 128 and Opred. Rast. Kavk. 458.—*Tripleurospermum daghestanicum* Rupr. ex Boiss. l. c. in syn.

Perennial. Plants 5–18 cm high, with more or less branched rhizome, sparsely covered with erect or semi-erect, simple hairs, strongly aromatic. Stem erect or ascending at base, simple, sparsely leafy. Leaves more or less hairy, with inconspicuous punctate-glandular hairs; basal and lower cauline leaves up to 5 cm long and 2 cm wide, on rather long (sometimes exceeding lamina), and basally thickened petiole, lamina broadly ovate to oblong, pinnately cut up to almost wingless axis; segments 2–4 on each side, short-petiolate or sessile, broadly ovate to oblong, pinnately parted up to narrow-winged axis, sometimes almost pinnately lobed, terminal segments or lobes obovate to oblong, 1.5–2.0 mm wide, subobtusate or with very short cusp; upper cauline leaves strongly reduced and weakly divided (sometimes partly entire), sessile or short-petiolate. Capitula solitary, on rather densely appressed-hairy peduncles, up to 3(4) cm long. Involucre 10–13 mm in dia, 4.0–5.5 mm long, more or less pubescent; involucre bracts herbaceous, outer rather broadly lanceolate, inner 1.5–2 times as long, linear oblong; all bracts with rather broad, brownish or dark brown, membranous border, appendiculately broadened at apex of inner bracts. Ligulate florets white, corolla tube about 1 mm long and limb 7–11 mm long; corolla of tubular florets 2.2–2.6 mm long. Achenes 1.8–2.2 mm long and about 0.6 mm wide, with 5–7 longitudinal ribs, corona 0.3–0.5 mm long, irregularly sharply toothed up to middle. Flowering July to August.

Stony slopes, rocks at altitudes above 2000 m.—*Caucasus*: Dagestan, Eastern Transcaucasia (northern part). Endemic. Described from Southern Dagestan. Type in Leningrad.

24. ***P. aromaticum*** (Rupr. ex Boiss.) Tzvel. comb. n.—*Cham. daghestanicum* var. *glabrous* Boiss. Fl. or. III (1875) 334.—*Tripleurospermum aromaticum* Rupr. ex Boiss. ibid. in syn.—?*T. nivale* Rupr. ex Boiss. ibid. in syn.

- 223 Perennial. Plants 5–15 cm high, with more or less branched rhizome, usually sparsely covered with erect, simple hairs, often subglabrous, strongly aromatic. Stem erect or ascending, sparsely leafy, simple. Leaves like previous species, but usually glabrous or subglabrous and with narrower terminal lobes (up to 1 mm wide) than in previous species. Capitula solitary, on more or less pubescent, up to 3 cm long, peduncle. Involucre 10–13 mm in dia and 4–5 mm long, glabrous or subglabrous (sparsely hairy near base); involucre bracts herbaceous, outer narrow-lanceolate, inner not more than 1.5 times as long as outer, oblong-linear; all bracts with rather wide, dark brown, membranous border, more or less appendiculately broadened at apex of inner bracts. Ligulate florets white, corolla tube about 1 mm long and limb 7–11

mm long; corolla of tubular florets 2.2–2.6 mm long. Achenes like previous species; mature achenes unknown. Flowering July to August.

Stony slopes, grassy patches, rocks above 2,500 m.—*Caucasus*: Dagestan. Endemic. Described from Dagestan (Diklos-Mta Mountain). Type in Leningrad.

Note. It is a more western or more alpine ecogeographical race. So far only the type specimens of this species are known, which, apparently, is explained by its distribution in inaccessible and poorly studied regions of Dagestan. The specimens of *Tripleurospermum nivale* Rupr. ex Boiss. are even smaller and were collected with still unopened capitula. It is possible that they belong to one of the species of *Tripleurospermum* Sch. Bip.

Series 6. *Trichophylla* Tzvel.—Plants with well developed, short, nonflowering shoots, usually covered with semi-erect simple hairs, often subglabrous; stems sparsely leafy; leaves twice-pinnately cut, with very narrow lobes; receptacle strongly convex; ligulate florets white; corona of achenes 0.2–0.3 mm long.

25. ***P. tricholobum*** Sosn. ex Manden. nom. nov. in Zam. po Sistem. i Geogr. Rast. Bot. Inst. Akad. Nauk Gruz. SSR, XXII (1961) 58.—*P. trichophyllum* Sosn. in Zam. po Sist. i Geogr. Bot. Inst. Akad. Nauk Gruz. SSR, XV (1949) 2, non Griseb. 1844.

Perennial. Plants 15–35 cm high, with slender branched rhizome, usually covered with sparse semi-erect, simple hairs, usually subglabrous. Stem erect or ascending at base, with few cauline leaves only in lower part, simple. Leaves glabrous or subglabrous, lacking distinct punctate-glandular hairs; basal and lower cauline leaves 10–12 cm long and 3.5 cm wide, on rather long petiole; lamina obovate to oblong, twice pinnately cut, with 4–6 segments on each side; terminal segments somewhat thick, linear-filiform, up to 0.6 mm wide, and 12 mm long; other cauline leaves strongly reduced, short-petiolate or
 224 subsessile. Capitula solitary, on rather long (10–15 cm) peduncles, more or less hairy in upper part. Involucre 8–15 cm in dia, 4–6 mm long, more or less pubescent to subglabrous at base; involucre bracts herbaceous, outer narrow-lanceolate, inner usually not more than 1.5 times as long as outer, oblong-linear; all bracts with wider dark brown, membranous border, more or less expanded to broadly lanceolate appendage at apex. Ligulate florets white, corolla tube 1.0–1.5 mm long and limb 8–12 mm long; corolla of tubular florets 2.4–3.0 mm long. Achenes (only immature achenes known), 1.8–2.4 mm long, with 5–6 longitudinal ribs and irregularly sharply toothed (sometimes divided up to base) corona 0.2–0.3 mm long, about 0.1 mm in ligulate florets. Flowering May to June.

Stony slopes, grassy patches, rocks above 2,000 m.—*Caucasus*: Ciscaucasia (eastern part), Dagestan. Endemic. Described from northern Ossetia. Type in Tbilisi.

Note. Morphologically, it is extraordinarily similar to the Caucasian species of the genus *Tripleurospermum* Sch. Bip., differing only by the very sparsely leafy stems and the structure of the achenes with a shorter corona. Because of the absence of mature achenes, the affinity of this species to the genus *Pyrethrum* still cannot be considered finally proved.

Series 7. Komarovia Tzvel.—Plants with well developed, short, nonflowering shoots, more or less covered with simple hairs, often subglabrous; stems sparsely leafy; leaves pinnately cut, with very narrow lobes; receptacle strongly convex; ligulate florets white; corona of achenes 0.5–1.3 mm long.

26. **P. komarovii** Sosn. in Dokl. Akad. Nauk Arm. SSR, II, 4 (1945) 119; Grossh. Opređ. Rast. Kavk. 461.

Perennial. Plants 5–20(25) cm high, with strongly branched rhizome, more or less covered with erect simple hairs mixed with pappilliform hairs, usually subglabrous. Stems erect or ascending at base, usually numerous and often forming pulvinous turf together with short nonflowering shoots, very sparsely leafy, simple. Leaves weakly pubescent, often subglabrous, with rather numerous punctate glandular hairs; basal and lower cauline leaves up to 3.5(4.0) cm long and 1.5(2.0) cm wide, on shorter, strongly flattened and basally thickened petiole; lamina broadly oblong to almost rotund, pinnately cut into very narrow
227 (up to 0.8 mm wide), linear-filiform, acute, 2–5-parted segments, 4–10 on each side; other cauline leaves strongly reduced, sessile or subsessile, usually with more or less pinnately parted lamina. Capitula solitary, on long (up to 10–12 cm), sparsely pubescent peduncle. Involucre 9–13 mm in dia, 4.0–5.5 mm long, more or less pubescent to entirely glabrous; involucre bracts herbaceous, outer lanceolate, subobtus, inner 1.5–2 times as long, broadly linear; all bracts with wide blackish-brown membranous border, appendiculately broadened at apex of inner bracts. Ligulate florets white, corolla tube 1.5–2.0 mm long and limb 8–12 mm long; corolla of tubular florets 2.6–3.2 mm long. Achenes (mature achenes unknown) 1.8–2.4 mm long and about 0.5 mm wide, with 5(?) longitudinal ribs; corona of achenes of tubular florets 0.5–1.3 mm long, strongly variable in shape and size, usually 2–5-lobed or divided almost to base, irregularly sharply toothed along margin; achenes of ligulate florets 0.1–0.3 mm long, often secund. Flowering June to July.

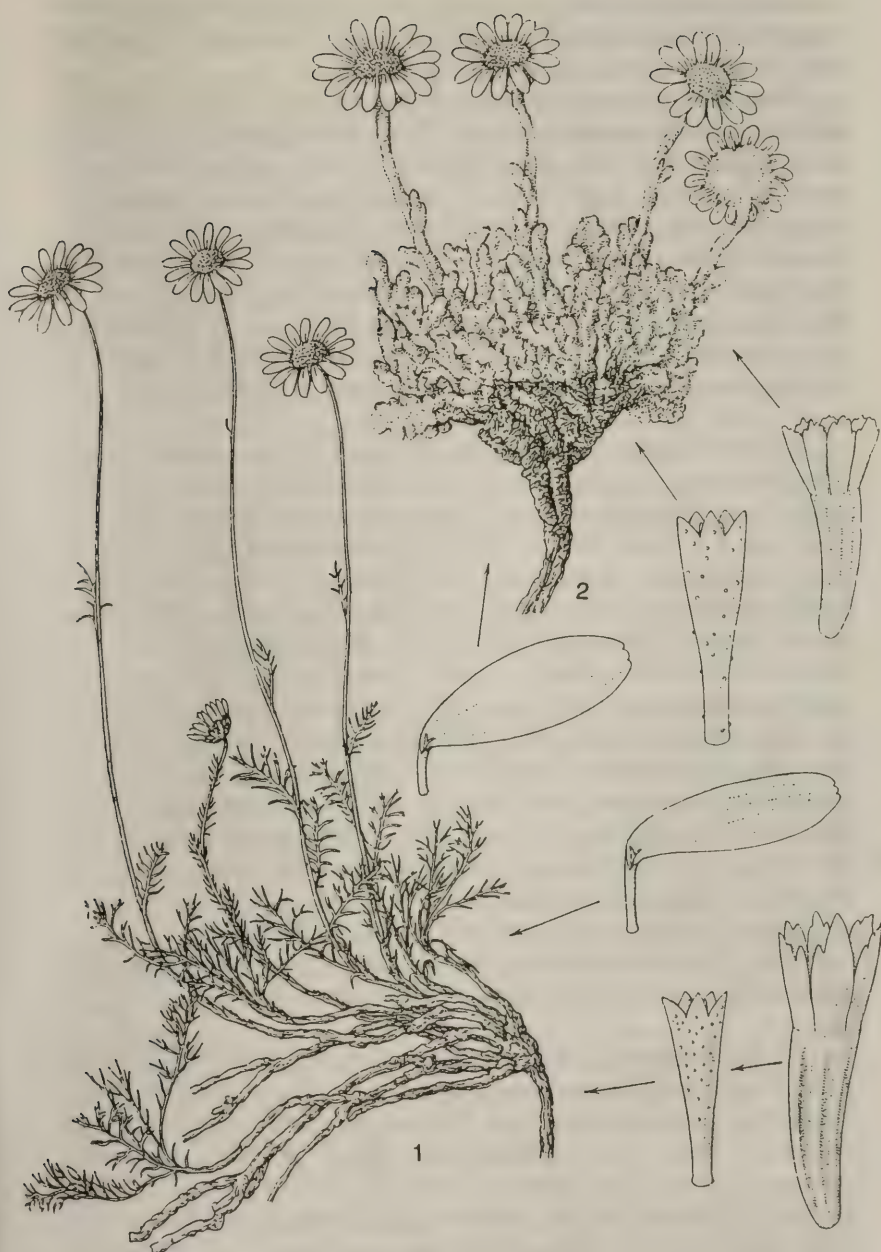


Plate IX.

Habit of plant, corolla of ligulate florets, corolla of tubular floret, and achene:
 1 — *Pyrethrum tienschanicum* Krasch.; 2 — *P. leontopodium* (Winkl.) Tzvel.

Rocks, stony slopes above 2,000 m.—*Caucasus*: Southern Transcaucasia (Zangezur and Murov-Dag ranges). Endemic(?). Described from Zangezur Range. Type in Tbilisi.

Note. The taxonomic position of this species, which strongly resembles some Transcaucasian and West Asian species of the genus *Tripleurospermum* Sch. Bip., remains unclear to me. Besides the previous species, with which *P. komarovii* shows a strong but, apparently, only superficial resemblance, this species is also more or less approaches species of section *Xylopyrethrum*, differing from them by the nature of the pubescence and nonlignified branches near the base, and some species of section *Richteria* (e.g., *P. pulchellum*). Because of the absence of mature achenes, the affinity of *P. komarovii* to the genus *Pyrethrum* cannot be considered as finally proved.

Section 8. *Leucanthemopsis* (Giroux) Tzvel. comb. nova.—*Tanacetum* sect. *Leucoglossa* § 3. *Alpina* Sch. Bip. *Tanacet.* (1844) 59.—*T.* sect. *Pyrethrum* subsect. *Leucanthemopsis* Giroux in *Bull. Soc. Hist. Nat. Afr. Nord.* XXIV (1933) 54.—Herbaceous plants, 5–20 cm high, more or less covered with short bifid hairs mixed with simple hairs, with sparsely leafy stems and well developed short nonflowering shoots. Leaves pinnately lobed, lower petiolate, upper sessile or subsessile. Capitula solitary. Involucre patelliform, 12–18 mm in dia; outer involucre bracts 2/3, less often 1/2 as long as inner. Receptacle strongly convex. Corolla limb of ligulate florets oblong, 7–15 mm long; corolla of tubular florets 2–3 mm long, with tube fairly strongly and abruptly broadened in upper half, toothed with lanceolate deltoid deflexed teeth. Achenes 2–3 mm long, with pericarp very loosely enclosing kernel and 5 weak ribs; corona 0.5–1 mm long, more or less irregularly toothed along margin.

Type of section: *Pyrethrum alpinum* (L.) Schrank.

Note. This section with a small number of species is distributed exclusively in the mountain regions of Western Europe.

27. ***P. alpinum*** (L.) Schrank, *Prim. Flor. Salisb.* (1792) 215; DC. *Prodr.* VI, 54.—*Chrysanthemum alpinum* L. *Sp. pl.* (1753) 889.—*Leucanthemum alpinum* (L.) Lam. *Fl. Franc.* II (1778) 138.—*Matricaria alpina* (L.) Desr. in *Lam. Encycl. meth.* III (1792) 730.—*Tanacetum alpinum* (L.) Sch. Bip. *Tanacet.* (1844) 61.—*Pontia alpina* (L.) Bub. *Fl. Pyr.* II (1900) 219.—**IC.**: Rchb. *IC. Fl. Germ.* XVI (1853) t. 990; Hegi, *Ill. Fl.* VI, 2, f. 319 and 320; Jav. and Csap. *IC. Fl. Hung.* 522, t. 38.—**EXS.**: Schultz, *Herb. norm. nov. ser.* No. 2203; *Fl. Ital. exs.* No. 1157; Hayek, *Fl. Stir. exs.* No. 795; *Fl. exs. Reip. Bohem. Sloven.* No. 80; *Fl. Pol. exs.* No. 353; *Pl. Pol. exs.* No. 173.

Perennial. Plants 5–15 cm high, with short creeping, more or less branched rhizome, more or less covered with appressed or semi-erect, bifid, often simple hairs. Stems few or solitary, erect or basally ascending, weakly leafy, simple. Leaves green, more or less pubescent to subglabrous; basal and lower cauline leaves rather long-petioles, usually 1.5–3 times as long as lamina; lamina more or less ovate, cuneately narrowed toward base, pinnately lobed, with 2–5 lobes on each side; other cauline leaves strongly reduced, less deeply lobed to linear with entire margin. Capitula solitary, on rather long, more or less pubescent peduncle. Involucre 12–18 mm in dia, 3.5–5.0 mm long, more or less pubescent to subglabrous; involucre bracts herbaceous, outer oblong-linear, inner linear, 1.5–2 times as long; all bracts with wide, blackish-brown, more or less discontinuously fimbriate, membranous border. Ligulate florets white, corolla tube about 1.5 mm long and limb 7–15 mm long; corolla of tubular florets 2–3 mm long. Achenes 2–3 mm long, about 0.8–1.0 mm wide, with 5 somewhat prominent longitudinal ribs and 0.5–1.0 mm long irregularly toothed corona. Flowering July to August.

Stony slopes, grassy areas, rocks in upper mountain zone.—*European part*: Upper Dniester (Carpathians). *General distribution*: Central Europe, Balkans, Mediterranean Region. Described from the Alps. Type in London.

Note. A highly polymorphic species, divided in several ecogeographical races mainly differing in the shape of the leaves, size of the capitulum and pubescence. Two very close ecogeographical races are distributed in the Carpathians, which perhaps deserve to be separated as independent species: *Pyrethrum alpinum* ssp. *tatrae* (Vierh.) Tzvel. comb. nova. [= *Chrysanthemum alpinum* f. *tatrae* Vierh. in *Mag. Bot. Lapok* XIII (1914) 25]—the more northern and higher mountain race, characterized by rather dense pubescence and smaller dimensions of the entire plant, and *P. alpinum* ssp. *cuneifolium* (Murr.) Tzvel. comb. nova (= *Leucanthemum alpinum* var. *cuneifolium* Murr. in *Deutsche Bot. Monatschr.* XIV (1896) 21)—the more southern and lower mountain race, distinguished by very sparse pubescence (plants usually almost glabrous). The species is reported by the western European authors from the Carpathians within the Soviet Union, although so far it has not been found here.

Section 9. *Xylopyrethrum* Tzvel. sect. nova in Addenda, XXV, 872.—Plants more or less woody at base, 5–20 cm high, more or less covered with adpressed or appressed bifid hairs, often mixed with simple hairs, with more sparsely leafy stem and well developed, short, non-flowering shoots (usually with elongated, more or less lignified

base). Leaves more or less pinnately or palmately cut, with very narrow lobes; all leaves more or less long-petiolate. Capitula solitary (but usually numerous on single plant). Involucre 5.5–12.0 mm in dia, narrow-patelliform or cupuliform. Receptacle strongly convex, conical-hemispherical. Corolla limb of ligulate florets oval to oblong, 7–12 mm long; corolla of tubular florets 2.5–3.2 mm long, with tube fairly weakly and gradually broadened in upper half, and lanceolate-deltoid recurved teeth. Achenes 2–3 mm long, with 5–7 longitudinal ribs, more or less shifted ventrally in ligulate florets; corona 0.2–1.0 mm long, more or less irregularly toothed or lobed, in ligulate florets usually divided dorsally almost up to base.

Type of section: *Pyrethrum kotschyi* Boiss.

Note. A whole series of species (including *P. tenuisectum* Boiss., *P. bornmülleri* Hausskn. and others), distributed in the mountainous regions of Western Asia, belong to this section, which does not show a distinct affinity with other sections of the genus. The section is divided in several distinctly isolated series.

Series 1. Kotschyana Tzvel.—Plants grayish from dense pubescence; involucre narrow-patelliform, 9–12 mm in dia; corona 0.5–1.0 mm long.

28. **P. kotschyi** Boiss. Diagn. ser. 1, VI (1845) 88 and Fl. or. III, 339; Grossh. Fl. Kavk. IV, 135 and Opred. Rast. Kavk. 461.—*Chrysanthemum kotschyi* (Boiss.) Nabel. in Publ. Fac. Sc. Univ. Masaryk. Brno, No. 52 (1925) 19.—**lc.**: Nabel. ibid. t. 5.—**Exs.**: Kotschy, Pl. Pers. austr. No. 770 (isotypes of species); Bornmüller, Iter pers. alt. No. 7443; Pl. or. exs. No. 322.

230 Perennial. Plants more or less woody at base, 5–20 cm high, with strongly thickened woody rhizome, grayish from dense pubescence of semierect bifid (often mixed with simple) hairs. Stems usually rather numerous, erect or basally ascending, more or less branched only at base. Leaves grayish from dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves numerous, up to 3 cm long, 1.5 cm wide, on rather long (as long as or slightly exceeding lamina) petiole, strongly thickened at base; lamina reniform or reniform-orbicular with narrow-cuneate base, 3–7-palmately cut or almost pinnate, with segments usually themselves twice or thrice cut up; terminal segments linear-subulate, up to 0.8 mm wide, with short cartilaginous cusp; cauline leaves strongly reduced, short-petiolate, with 3–5 parted lamina, uppermost leaves often entire. Capitula solitary (but many on a single plant), on rather long (up to 10 cm) peduncle. Involucre 9–12 mm in dia, 4.0–5.5 mm long, finely tomentose near base; involucre

bracts coriaceous-herbaceous, outer lanceolate, inner 1.5, less often 2, times as long, broadly linear; all bracts with wide, blackish-brown, membranous border, appendiculately broadened at apex. Ligulate florets white, with 1.2–1.8 mm-long corolla tube and 8–12 mm-long limb; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.0–2.5 mm long, about 0.5 mm wide, with 5–6 longitudinal ribs and irregularly toothed or lobed 0.5–1.0 mm long corona, often divided almost to base on ventral side. Flowering June to July.

Stony slopes, rocks at 2,000–3,500 m.—*Caucasus*: Southern Transcaucasia (eastern part of Nakhichevan ASSR). *General distribution*: Armenia-Kurdistan, Iran (northwestern part). Described from Iran. Type in Geneva; isotype in Leningrad.

29. **P. ordubadense** Manden. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 358.—*P. tenuisectum* auct. non Boiss.: Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 84; Grossh. Fl. Kavk. IV, 135 and Opred. Rast. Kavk. 461.

Perennial. Plants more or less woody at base, 5–20 cm high, with thick woody rhizome, grayish from dense pubescence of bifid hairs mixed with simple hairs. Stems usually rather numerous, erect or ascending near base, more or less branched only near base. Leaves like previous species; basal leaves sometimes larger (up to 4.5 cm long). Capitula solitary (but numerous on a single plant), on rather long peduncle. Involucre 9–12 mm in dia, 4.0–5.5 mm long, finely tomentose near base; involucre bracts coriaceous-herbaceous, outer broadly lanceolate a half, less often two-fifths as long as broadly linear inner bracts; all bracts with rather wide, brownish, membranous border, appendiculately broadened at apex in inner bracts, slightly larger than in previous species. Ligulate florets white, corolla tube 1.2–1.8 mm long and limb 8–12 mm long; corolla of tubular florets 2.5–3.0 mm long. Achenes like previous species. Flowering May to July.

231 Stony slopes, rocks at 1,500–3,000 m.—*Caucasus*: Southern Transcaucasia (region of Ordubad). *General distribution*: Armenia-Kurdistan(?). Described from Soyukh Mountain near Ordubad. Type in Leningrad.

Note. This species, which is very close to the preceding species, is a lower mountain ecogeographical race by comparison.

Series 2. Fruticulosa Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 16.—Plants weakly hairy; involucre cupuliform, 5.5–7.0 mm in dia; corona 0.2–0.3 mm long.

30. **P. heldreichianum** Fenzl. ex Tchih. As. Min. II (1860) 273.—*P. suffruticulosum* Fenzl. ex Tchih. ibid. in syn.—*P. fruticosum* Fenzl. ex Boiss. Fl. or III (1875) 338; Sosn. in Tr. Tifl. Bot. Sada, XVII, 16; Grossh. Fl. Kavk. IV, 135, non Biehl. 1807.—*Tanacetum heldreichianum* Fenzl. ex Tchih. op. cit. 273, nom. altern.—Exs.: Sintenis, Iter or No. 5639; Bourg. Pl. armen. No. 145.

Perennial. Plants more or less woody at base, 6–15 cm high, with thick woody rhizome, more or less covered with semi-erect bifid and simple hairs. Stems usually rather numerous, erect, more or less branched only at base. Leaves usually dull green from sparser pubescence, with numerous punctate-glandular hairs; basal leaves up to 3.5 cm long, 1 cm wide, on rather long petiole, thickened at base; lamina oblong to linear-oblong, pinnately cut; leaf segments 4–8 on each side, approximate, linear-subulate, up to 0.6 mm wide, usually entire, less often 2–3 parted, with short cartilaginous cusp; cauline leaves strongly reduced, short-petiolate, uppermost entire. Capitula solitary (but numerous on a single plant) on rather long (up to 8 cm) peduncles. Involucre 5.5–7.0 mm in dia, 5.0–6.5 mm long, densely pubescent at base; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, a half, less often two-fifths as long as oblong-linear inner bracts; all bracts with rather wide, dark brown, membranous border, appendiculately broadened at apex in inner bracts. Ligulate florets white, corolla tube 1.2–1.8 mm long and limb 7–9 mm long; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.5–3.0 mm long, 0.6–0.7 mm wide, with 5–7 longitudinal ribs; corona of achenes of tubular florets 0.2–0.3 mm long, usually irregularly toothed to middle, divided to base on dorsal side, achenes of ligulate florets 0.1–0.2 mm long. Flowering June to August.

Rocks, stony slopes, screes in upper mountain zone.—*Caucasus*: Likely to be found in south of Georgian SSR. *General distribution*: Armenia-Kurdistan. Described from northeastern Turkey. Type and isotypes in Leningrad.

Note. The species is common in the region of Artvin and Kars near the USSR border, and its occurrence in the south of Transcaucasia is very probable.

- 232 *Section 10. Pyrethrum*.—*P. sect. Leucoglossa* DC. Prodr. VI (1837) 53 p. p.—*P. sect. Eupyrethrum* D. Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 16 p. p.—*Chrysanthemum sect. Pyrethrum* (Zinn) Gaud. Helv. V (1829) 346 p. p.; Hoffm. in Pflanzenfam. IV, 5 (1889) 278 p. p.—*Tanacetum sect. Leucoglossa* § 2. *Macrosperma* Sch. Bip. Tanacet. (1844) 56.—*T. sect. Pyrethrum* subsect. *Eupyrethrum* Briq. in Burnat, Fl. Alpes Marit. VI (1916) 119.—*T. sect. Pyrethrum* subsect.

Pyrethrum (Zinn) Heywood in Anal. Inst. Bot. Cavanill. Madrid. XII, 2 (1953) 324.—Herbaceous plants, (15)20–100(150) cm high, usually covered with rather long, bifid and simple, less often only simple hairs, with more sparsely leafy stems and well developed, short, nonflowering shoots. Leaves pinnately cut; lower leaves petiolate, middle and upper sessile. Capitula usually 2–12, less often up to 20, in lax or somewhat lax corymbs, sometimes solitary; involucre narrow-patelliform or patelliform, 8–16 mm in dia; receptacle rather strongly convex, almost hemispherical. Corolla limb of ligulate florets oblong-linear or oblong, 9–16 mm long; corolla of tubular florets 1.8–2.4 mm long, tube weakly and gradually broadened in upper half, with deltoid, weakly bent teeth. Achenes 2.2–3.0 mm long, with 5–8 longitudinal ribs, more or less ventrally shifted in ligulate florets; corona 0.3–1.5 mm long, irregularly bluntly or subacutely lobed and finely toothed up to middle.

Type of section: type of genus.

Note. A small section in number of species to which, besides the four species in the flora of the USSR described below, only a few species of the genus from Southern Europe and Asia Minor belong. All species are closely related ecogeographical races of a single series.

31. ***P. corymbosum*** (L.) Willd. Sp. pl. III (1803) 2155; MB. Fl. taur.-cauc. II, 325 and III, 578; DC. Prodr. VI, 57; Ldb. Fl. Ross. II, 551; Boiss. Fl. or. III, 342, p. p.; Grossh. Fl. Kavk. IV, 136 and Opred. Rast. Kavk. 461; Kryl. Fl. Zap. Sib. XI, 2750.—*P. tauricum* Zelenetzky, Mat. Fl. Kryma (1906) 296.—*Chrysanthemum corymbosum* L. Sp. pl. (1753) 890; Schmalh. Fl. II, 69.—*C. corymbiferum* L. Sp. pl. (1763) 1251.—*Matricaria corymboasa* (L.) Desr. in Lam. Encycl. III (1792) 734.—*Tanacetum corymbosum* (L.) Sch. Bip. Tanacet. (1844) 57.—*Leucanthemum corymbosum* (L.) Gren. and Godr. Fl. Franc. II (1850) 145.— **Ic.:** Rchb. Ic. Fl. Germ. XVI (1854) t. 993; Syreistsch. Ill. Fl. Mosk. Gub. III, 268; Bonnier, Fl. Compl. France, Suisse et Belg. V, t. 293; Hegi, Ill. Fl. VI, 2, t. 265, Fig. 2; Jav. and Csap. Ic. Fl. Hung. 523; Krashenninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 345, Fig. 680; Mikhail. in Fl. Beloruss. V (1959) Plate 32.— **Exs.:** Fl. exs. Austro-Hung. No. 3782; Pl. Herceg. exs. No. 194; Hayek. Fl. Stir. exs. No. 1076; Fl. exs. reip. Bohem.-Sloven. Nos. 283 and 947; Pl. Polon. exs. No. 273; Fl. Polon. exs. No. 741, GRF. No. 3265.

Perennial. Plants 30–120(150) cm high, with more or less thick, inclined rhizome, more or less covered with rather long adpressed and erect, bifid hairs, often mixed with simple hairs, sometimes subglabrous. Stems solitary or few, erect, very sparsely leafy, usually more or less branched only near tip, very rarely simple. Leaves usually sparsely hairy, green, often completely glabrous above, with inconspicuous

punctate-glandular hairs, or eglandular; basal leaves up to 30–40 cm long, on rather long (but always shorter than lamina) petiole, with oblong or linear-oblong lamina, pinnately cut to almost wingless axis; leaf segments 8–20 on each side, oblong or lanceolate, more or less pinnately lobed or pinnately parted, with sharp-toothed lobes; cauline leaves like basal but reduced and with shorter lamina, lower petiolate, upper and middle sessile. Capitula (1)3–15(20), in rather lax, corymbs, on long (up to 10 cm) peduncles more or less hairy above. Involucre 8–14 mm in dia, 4–5 mm long, more or less adpressed hairy at base and frequently also on dorsally; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, inner 1.5–2 times longer, broadly linear; all bracts with narrow, light or brownish, membranous border, more or less appendiculately broadened at apex in inner bracts. Receptacle 2–3 times wider than long. Ligulate florets white, corolla tube about 1.5 mm long and limb 10–16 mm long; corolla of tubular florets 1.8–2.5 mm long. Achenes 2.0–2.5 mm long and about 0.8–1.0 mm wide, with 5 (rarely up to 7) prominent, longitudinal ribs and 0.5–0.8 mm long corona, bluntly toothed or lobed up to middle. Flowering June to August.

Deciduous forests, scrubs, forest glades up to middle mountain zone.—*European part*: Ladoga-Ilmen (near Lake Onega), Volga-Kama, Upper Volga, Upper Dnieper, Upper Dniester, Volga-Don, Trans-Volga Region, Bessarabia, Black Sea Region, Lower Don, Lower Volga (northern part), Crimea (mountains); *Western Siberia*: Upper Tobol (sporadic), Irtysh (sporadic), Altai (northwestern foothills); *Caucasus*: Ciscaucasia, Dagestan, Eastern Transcaucasia (northern part), Western Transcaucasia, Southern Transcaucasia (northwestern part). *General distribution*: Almost all of Europe, except northern regions, Turkey. Described from Central Europe. Type in London.

Note. The specimens from the more arid habitats have denser silky pubescence on the lower leaf surface. Probably, *P. tauricum* Zelenetzky from Crimea was described from such specimens, which, unfortunately, I did not see. Here too, apparently, belong the specimens from Crimea identified by N. Zelenetzky (op. cit. p. 296) as "*P. poteriifolium* Ldb.," although occurrence of the latter species in the eastern regions of Crimea is quite probable.

P. tenuifolium Willd. [*Enum. hort. berol.* (1809) 906], described from garden specimens allegedly originating from the Caucasus, according to the report of L. Reichenbach (*Fl. Germ. exc.* II, 1830, p. 231), is an Italian species without close affinity to *P. corymbosum*. Thus *P. corymbosum* var. *tenuifolium* (Willd.) Ldb. cannot be used for Caucasian specimens of *P. corymbosum* with more deeply dissected leaves.

32. **P. clusii** Fisch. ex Rchb. Fl. Germ. exc. II (1830) 231.—*P. subcorymbosum* (Schur) Schur, Enum. Pl. Trans. (1866) 337; M. Popov, Ocherk Rast. i Fl. Karpat. 250; Klok. in Vizn. Rosl. URSR, 540.—*Chrysanthemum subcorymbosum* Schur in Verh. und Mitth. Siebenb. Ver. X (1859) 146.—*C. clusii* (Fisch. ex Rchb.) Kreutz, Anthochron. Pl. Eur. Med. (1840) 60, 219; Hand.-Mazz. in Wettst. Sched. Fl. Exs. Austro-Hung. X, 63.—*C. corymbosum* b. *clusii* (Fisch. ex Rchb.) Halacsy, Fl. Nied.-Oesterr. (1896) 273.—*Tanacetum subcorymbosum* (Schur) Simonk. Enum. Fl. Trans. (1886) 312.—*T. corymbosum* ssp. *subcorymbosum* (Schur) B. Pavl. in Pl. Polon. exs. No. 274.—**Exs.**: Fl. exs. Austro-Hung. No. 3783; Pl. Polon. exs. No. 274; Fl. Polon. exs. No. 742.

Perennial. Plants 25–65 cm high, with more or less thick, inclined rhizome, more or less covered with rather long bifid hairs, often mixed with simple hairs, sometimes subglabrous. Stems solitary or few, erect, very sparsely leafy, simple or more or less branched in upper part. Leaves like previous species. Capitula solitary or 2–10 (less often to 15) on a single stem and then in lax corymb. Involucre 8–14 mm in dia, 4–5 mm long, more or less pubescent at base, less often also, dorsally; involucre bracts with broader, dark brown, membranous border, otherwise like previous species. Receptacle much more convex than in previous species, usually 1.5 times as wide as long. Ligulate florets white, corolla tube about 1.5 mm long and limb 12–18 mm long; corolla of tubular florets 1.8–2.5 mm long. Achenes 2.0–2.5 mm long, about 0.8 mm wide, with 5 (less often up to 7) longitudinal ribs, and corona more or less toothed or lobed, 0.5–0.8 mm long. Flowering June to August.

Meadows, forest glades, scrubs above 1,500 m.—*European part*: Upper Dniester (Carpathians). *General distribution*: Central Europe, Balkans. Described from Carpathians. Type in Leipzig.

Note. A higher mountain ecogeographical race in comparison with the previous species, related to it through transitional forms.

33. **P. corymbiforme** Tzvel. sp. nova in Addenda, XXV, 873.—*P. corymbosum* auct. non L.: Kar. and Kir. in Bull. Soc. Nat. Mosc. XV, 382; O. and B. Fedch. Perech. Rast Turk. IV, 187.—*P. corymbosum* var. “fol. segmentis profundius divisis, pappo coroniformi brevior” Ldb. Fl. Ross. II (1845–1846) 551.

Perennial. Plants 30–100 cm high, with more or less thick inclined rhizome, usually covered with rather long adpressed simple hairs, often subglabrous. Stems solitary or few, erect, relatively sparsely leafy, usually more or less branched only in upper part, less often simple. Leaves green, usually very sparsely hairy, glabrous or subglabrous

above, sparsely hairy beneath, lacking distinct punctate-glandular hairs; basal and lower cauline leaves 20–25 cm long and 6–8 cm wide, on rather long (but always shorter than lamina) petioles; lamina oblong to broadly linear, usually gradually narrowed toward base, pinnately cut; leaf segments 8–20 on each side, oblong or lanceolate, pinnately parted or lobed, terminal segments and lobes usually more or less toothed, with acuminate teeth; middle and upper cauline leaves strongly reduced, sessile. Capitula (1)2–6(10) on a single stem, in lax, simple, corymbose-racemes; peduncles up to 15–18 cm long, glabrous or subglabrous. Involucre 8–12 mm in dia, 3.5–4.5 mm long, glabrous; involucre bracts coriaceous-herbaceous, outer lanceolate, inner 1.5–2 times as long, lanceolate-linear; all bracts with very narrow, brownish, membranous border, somewhat broadened at apex in inner bracts. Ligulate florets white, corolla tube 1.0–1.5 mm long and limb 9–15 mm long; corolla of tubular florets 2.0–2.5 mm long. Achenes 2.0–2.5 mm long, with 5–8 longitudinal ribs and 0.3–0.5 mm long corona, usually irregularly lobed and finely toothed almost up to middle. Flowering June to August.

Meadows, scrubs, forest glades in middle mountain zone.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau). *General distribution*: Dzhungaria-Kashgaria(?). Described from Dzhungarian Alatau. Type (“*in rupestribus Alatau, ad fl. Sarchen*,” Karelin and Kirillov, Enum. 1841, No 441); isotypes in Leningrad.

Note. Despite great morphological resemblance to the previous species, this species is quite distinct from them (with a completely isolated range) by having pubescence of only simple hairs, capitula usually aggregated in corymbose-racemes and a glabrous involucre, as well as a shorter and more deeply divided achene corona.

34. ***P. poteriifolium*** Ldb. apud Nordm. in Bull. Acad. Sc. Petersb. II (1837) 312 and Fl. Ross. II, 550; Lipsky in Tr. Peterb. Bot. Sada, XIII, 307; Sosn. in Tr. Tifl. Bot. Sada, XVII, 28; Grossh. Fl. Kavk. IV, 136 and Opred. Rast. Kavk. (1949) 461; Manden. in Fl. Gruzii, VIII, 359.—*P. corymbosum* auct. non Willd.: Boiss. Fl. or. III, 342, p. 236 p.—*P. corymbosum* var. *oligocephalum* Lipsky in Zap. Kievsk. Obshch. Estestv. XII (1892) 359.—*P. ponticum* Albov in Bull. Herb. Boiss. II (1894) 454.—*P. starkianum* Albov ibid. 454; Sosn. op. cit. 29; Grossh. op. cit. IV, 134 and (1949) 460; Manden. op. cit. 359.—*Chrysanthemum poteriifolium* (Ldb.) Bornm. in Fedde, Repert. LIII (1944) 341.— **Ic.**: Manden. op. cit. Plates 397 and 396.— **Exs.**: Fl. cauc. exs. No. 24.

Perennial. Plants 15–60 cm high, with thick inclined rhizome, dull- or grayish-green from dense pubescence of rather long bifid and simple hairs. Stems solitary or few, erect, sparsely leafy, simple or with few lateral branches above. Leaves dull- or grayish-green from rather

extensive, somewhat sparse pubescence, often more or less tomentose beneath, with inconspicuous punctate-glandular hairs; basal leaves 15 cm long, 4 cm wide, on rather long (but shorter than lamina) petioles; lamina oblong or oblong-linear, pinnately cut up to wingless or almost wingless axis; leaf segments 5–12 on each side, broadly ovate to oblong, sessile, pinnately parted or lobed; terminal segments and lobes broadly lanceolate to oblong, up to 3 mm wide, usually more or less toothed or lobed; lower cauline leaves like basal, middle and upper strongly reduced, sessile. Capitula solitary or 2–4(6) on a single stem, and then on very long (up to 20 cm) peduncles in lax corymb. Involucre 9–16 mm in dia and 4–6 mm long, rather densely adpressed hairy almost entirely, less often sparsely hairy; involucre bracts coriaceous-herbaceous, outer lanceolate, inner 1.5, less often 2 times as long, broadly linear; all bracts with very narrow, light colored or brownish membranous border, somewhat broadened at apex in inner bracts, more or less lacking in outer. Ligulate florets white, corolla tube 1.0–1.5 mm long and limb 9–13 mm long; corolla of tubular florets 1.8–2.4 mm long. Achenes 2.4–3.0 mm long and about 0.8 mm wide, with 5–8 longitudinal ribs; corona 0.8–1.5 mm long, more or less lobed and irregularly sharply toothed. Flowering June to August.

Stony slopes, meadows, forest glades up to upper mountain zone.—*Caucasus*: Ciscaucasia (western part), Western Transcaucasia (Abkhazian ASSR). Endemic. Described from Abkhazian ASSR. Type and isotypes in Leningrad.

Note. In the nature of the pubescence and the shape of the leaves, the type [? typical] specimens of *P. starckianum* Albov are entirely similar to the type of *P. poteriifolium* Ldb., which also has only a single capitulum and, according to the author of this species, was also collected from the subalpine zone. These species should be considered entirely synonymous, as noted already by Lipsky (*Fl. Kavk.* 1899, 349); however, until recently they were considered separate species, and, without any justification, only larger specimens with sparse pubescence and few capitula on a single stem were included under *P. poteriifolium* Ldb. Such specimens seem to occupy an intermediate position between *P. poteriifolium* and *P. corymbosum*, but they hardly deserve to be treated as a separate species, which in this case should be called, not *P. poteriifolium* Ldb., but *P. ponticum* Albov.

The relatively rare, larger but densely hairy specimens of the species—*P. starckianum* var. *foliosa* Albov [*Prodr. Fl. Colch.* (1895) 137], hardly have any taxonomic significance.

Section 11. Richterriopsis Tzvel. sect. nova in Addenda, XXV, 872.—Herbaceous plants, 15–35 cm high, densely covered with

appressed bifid hairs, often mixed with simple, weakly leafy stems and well developed, short, nonflowering shoots. Leaves twice pinnately cut, lower more or less long-petiolate, middle and upper sessile. Capitula solitary, less often 2–8 on a single stem, on long leafy peduncles, not in regular corymbs; involucre 9–20 mm in dia, narrow-patelliform; receptacle weakly convex; corolla limb of ligulate florets oblong or oblong-linear, 7–20 mm long; corolla of tubular florets 2.2–4.0 mm long, with long and narrow tube, slightly and gradually expanded in upper half, with deltoid, slightly recurved teeth. Achenes 1.8–3.2 mm long, with 8–12 longitudinal ribs; corona 0.1–0.3 mm long, irregularly toothed or lobed up to middle, less often almost up to base; joint between corolla and achene inconspicuous in ligulate florets, usually with very short corona, and ribs more or less ventrally shifted.

Type of section: *Pyrethrum sericeum* (Adam) M.B.

Note. Relatively few (about 8–10) species of this section, distributed in the countries of Western Asia (especially in Turkey) and in the Caucasus, morphologically resemble some species of section *Richteria*, differing from them, however, by a weakly convex receptacle, pubescence almost exclusively of bifid hairs, and very short achene corona. Section *Richteriopsis* differs from the equally close section *Pyrethrum* by having achenes usually with 10 (and not 5) ribs and a very short corona, weakly convex receptacle, dense pubescence of shorter hairs, and twice pinnately cut leaves with very narrow lobes.

Series 1. Sericea Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 17.—Outer and usually also middle involucre bracts lanceolate, acuminate, almost lacking membranous border.

35. **P. sericeum** (Adam) MB. Fl. taur.-cauc. II (1808) 323 and III (1819) 577; DC. Prodr. VI, 55; Ldb. Fl. Ross. II, 551; Boiss. Fl. or.
 238 III, 339 p. p.; Sosn. in Tr. Tifl. Bot. Sada, XVII, 17; Grossh. Fl. Kavk. IV, 135 and Opred. Rast. Kavk. 461.—*Chrysanthemum sericeum* Adam in Web. and Mohr. Beitr. I (1805) 69, non Hoffmagg. and Link, 1820.—*Tanacetum sericeum* (Adam) Sch. Bip. Tanacet. (1844) 59.—**lc.**: MB. Cent. Pl. rar. ruth. II, 3 (1843) t. 78.—**Exs.**: Fl. cauc. exs. No. 325; Pl. or. exs. No. 299.

Perennial. Plants 15–35 cm high, with thick, more or less branched rhizome, sericeous-grayish (but turning brownish on drying of the pubescence) from dense pubescence of long and short bifid hairs, usually mixed with simple. Stems few or solitary, erect or ascending at base, densely hairy, simple. Leaves grayish (turning brown when dry) from dense pubescence, lacking distinct punctate glandular hairs; basal leaves up to 20(25) cm long and 3(4) cm wide, on rather long

(but shorter than lamina), densely villous petiole, thickened at base; lamina broadly linear or linear-oblong, twice pinnately cut; terminal segments narrow-linear to linear-lanceolate, up to 1.5 mm wide, gradually narrowed apically into short cusp; cauline leaves few, strongly reduced, lower short-petiolate, others sessile. Capitula solitary, on peduncles up to 10–15 cm long. Involucre 9–16 mm in dia, 7–10 mm long, densely villous; involucre bracts coriaceous-herbaceous, outer narrow-lanceolate, acuminate, with narrow membranous border only in upper part, inner more or less 1.5 times as long, linear, or oblong-linear, with narrow, brownish, membranous border irregularly fimbriate on margin and appendiculately broadened at apex. Corolla of ligulate florets white, tube 2.0–2.5 mm long and limb 12–20 mm long; corolla of tubular florets 3–4 mm long. Achenes 2.5–3.2 mm long and 0.6–0.8 mm wide, with 9–12 longitudinal ribs; corona 0.1–0.2 mm long, irregularly blunt-toothed almost up to base. Flowering June to July.

Stony and rubbly slopes, rocks in lower and middle mountain zones.—*Caucasus*: Eastern Transcaucasia (eastern part), Western Transcaucasia (eastern part), Southern Transcaucasia (western and northern parts). Endemic. Described from Transcaucasia. Type and isotypes in Leningrad.

36. ***P. oxylepis*** (Bordz.) Tzvel. comb. nova.—*P. aucherianum* auct. non DC.: Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 18; Grossh. Fl. Kavk. IV, 136.—*P. aucherianum* var. *oxylepis* Bordz. in Zap. Kievsk. Obshch. Estestv. XXV, 1 (1915) 122.—*Chrysanthemum oxylepis* Bordz. ibid. 122 in syn.—**Exs.**: Sintenis, Iter. orient. No. 5977.

Perennial. Plants 15–30 cm high, with thick, more or less branched rhizome, grayish from dense pubescence of bifid (mixed with simple) hairs. Stems usually rather numerous, less often solitary, erect or ascending at base, more or less branched from middle or slightly below, less often simple. Leaves grayish from dense pubescence, with numerous inconspicuous, punctate-glandular hairs; basal leaves up to 10–12 cm long and 2.0(2.5) cm wide, on rather long, basally strongly thickened petiole; lamina oblong to broadly linear, twice pinnately cut; terminal segments narrow-linear to linear-lanceolate, up to 0.8 mm wide, with short cartilaginous cusp; middle and upper cauline leaves strongly reduced, sessile. Capitula (1)2–5(8) on each stem, usually not in regular corymbs; peduncles of capitula up to 15 cm long, densely hairy. Involucre 9–12 mm in dia, about 5 mm long, rather densely adpressed hairy; involucre bracts coriaceous-herbaceous, outer broadly lanceolate, acuminate, almost lacking border, inner 1.5, less often twice as long, oblong or oblong-linear, with narrow, brownish membranous border in upper part, terminating into narrow and acute appendage at apex. Ligulate florets

white, corolla tube about 1.8 mm long and limb 7–12 mm long; corolla of tubular florets 2.2–2.8 mm long. Achenes 2.2–2.6 mm long and about 0.6 mm wide, with 8–10 longitudinal ribs; corona 0.1–0.2 mm long, irregularly blunt-toothed almost up to base. Flowering June to July.

Rocks and stony slopes of middle mountain zone.—*Caucasus*: Likely to be found in Southern Transcaucasia. *General distribution*: Armenia-Kurdistan. Described from Turkey. Type in Kiev.

Note. The species is common in Turkey near Kagizman close to the USSR border, and its occurrence in Armenia or southern Georgia is very probable. D.I. Sosnowsky (op. cit.) erroneously identified this species with *P. aucherianum*. In fact, it is much more similar to the previous species, with which it is also related through *P. gracile* Sosn. of this series [in *Vestn. Tifl. Bot. Sada*, XI (1915) 17 and in *Tr. Tifl. Bot. Sada*, XVII (1915) 17], described from the region of Oltu in Turkey. *P. gracile* is similar to *P. oxylepis* in the nature of the pubescence, but has larger solitary capitula, as in *P. sericeum*. The reports of *P. sericeum* from Turkey (e.g., Boiss. *Fl. or.* III, 339), apparently relate to this species.

Series 2. Aucheriana Tzvel.—Outer involuclral bracts broadly linear, obtuse, and like inner bracts, with broad membranous border.

37. ***P. aucherianum*** DC. Prodr. VII (1838) 297; Boiss. *Fl. or.* III, 340.—*P. leucanthemiflorum* Boiss. and Huet in Boiss. *Diagn. ser.* II, 3 (1856) 28.—*P. pseudoanthemis* Boiss. and Huet *ibid.* (1856) 28.—*P. roopianum* (Bordz.) Sosn. in *Tr. Tifl. Bot. Sada*, XVII (1915) 19; Grossh. *Fl. Kavk.* IV, 136.—*Matricaria argentea* L. *Sp. pl.* (1763) 1256.—*Chrysanthemum argenteum* (L.) Willd. *Sp. pl.* III, 3 (1803) 2146, non *Pyrethrum argenteum* Boiss. 1875.—*C. roopianum* Bordz. in *Tr. Bot. Sada Yur'evsk. Univ.* XIII (1912) 23.—*C. aucherianum* var. *roopianum* (Bordz.) Bordz. in *Zap. Kievsk. Obshch. Estestv.*, XXV, 1 (1915) 121.—*Tanacetum aucherianum* (DC.) Sch. Bip. *Tanacet.* (1844) 49.—*T. tournefortii* Sch. Bip. *ibid.* 59, nom. nov. (= *Matricaria argentea* L.).

Perennial. Plants 15–35 cm high, with thick, more or less branched rhizome, grayish from dense pubescence of bifid (mixed with simple) hairs. Stems few or solitary, erect or ascending at base, simple, less often with 1–2 lateral branches from middle. Leaves grayish from dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves 10–12 cm long, 2.5 cm wide, on rather long petiole; lamina oblong to broadly linear, twice pinnately cut, terminal segments linear to broadly lanceolate, subacute; middle and upper cauline leaves strongly reduced, sessile. Capitula solitary, less often 2–3 on each stem; peduncles of

capitula 10–15 cm long, densely hairy. Involucre 9–12 mm in dia, 4–5 mm long, usually more or less hairy only near base; involucre bracts coriaceous-herbaceous, outer broadly ovate, obtuse, inner 1.5–2 times as long, oblong; all bracts with broad, lighter colored or brownish, membranous border appendiculately broadened at apex in inner bracts. Ligulate florets white, corolla tube 1.5–2.0 mm long and limb 7–12 mm long; corolla of tubular florets 2.2–2.8 mm long. Achenes 2.2–2.8 mm long, about 0.6–0.8 mm wide, with 8–10 longitudinal ribs; corona 0.1–0.2 mm long, more or less irregularly blunt-toothed along margin. Flowering July to August.

Rocks and stony slopes.—*Caucasus*: Likely to be found in Southern Transcaucasia. *General distribution*: Armenia-Kurdistan. Described from Turkey. Type in Geneva.

Note. Judging from the garden specimens (particularly those sent by Willdenow) available in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR, *Matricaria argentea* L., usually considered a synonym of *P. sericeum*, also belongs to this species. The description of *Chrysanthemum roopianum* Bordz. is mainly the result of the imprecise identification of *P. oxylepis* as "*P. aucherianum* DC." Later, the author himself included *C. roopianum* as a variety of this latter species, distinguishing it from typical *P. aucherianum* only by smaller capitula. The last character should not be given much importance, as the specimens of *C. roopianum* were collected in nonflowering condition.

Section 12. Brachyglossa Tzvel. sect. nova in Addenda, XXV, 872.—Usually basally more or less woody 10–15 cm high plants, usually covered with rather long bifid and simple or only simple hairs, with sparsely leafy stem and well developed, short, nonflowering shoots. Leaves pinnately cut, with more or less pinnately lobed or pinnately parted segments; lower leaves petiolate, upper sessile or subsessile. Capitula solitary, less often 2–5, not forming regular corymbs; involucre cupuliform, 6–13 mm in dia; receptacle weakly convex, usually almost flat; ligulate florets fewer; ligule oval, less often oblong, 6–12 mm long; corolla of tubular florets 2.5–3.2 mm long, with tube slightly and gradually broadening in upper part, with deltoid, weakly recurved teeth. Achenes 2.3–3.2 mm long, with 6–8 longitudinal ribs; corona 0.2–0.6 mm long, more or less lobed and toothed up to middle, less often almost up to base, often strongly reduced in achenes of ligulate florets.

Type of section: *Pyrethrum hissaricum* Krasch.

Note. An endemic Central Asia section, represented by four narrowly endemic species not showing close affinity with each other. Particularly distinct is the species *P. semenovii*, probably deserving separation as a monotypic section. Despite these differences, the species

of this section have several features in common (fewer ligulate florets with a more or less reduced ligule that, apparently, have a tendency to disappear, slightly convex, almost flat receptacle, cupuliform involucre, relatively weakly dissected leaves, etc.), which differentiate them quite well from other sections of the genus.

38. **P. hissaricum** Krasch. in Fedde, Repert, XXVI (1929) 26.—*Chrysanthemum hissaricum* (Krasch.) Bornm. in Fedde, Repert, LXXXIX (1944) 339 in obs.

Perennial. Plants 20–40 cm high, with thick woody rhizome, grayish from dense tomentum of flexuous bifid and simple hairs. Stems usually rather numerous, less often solitary, erect or ascending, weakly leafy, branched only near somewhat woody base. Leaves grayish from dense tomentum, with inconspicuous glandular hairs under tomentum; basal leaves up to 8–10 cm long, 2.2 cm wide, on rather long (but shorter than lamina) petiole, strongly thickened at base in almost coriaceous sheath; lamina oblong or broadly linear, pinnately parted or pinnately cut up to narrow-winged axis; leaf segments numerous, sessile, oblong or linear-oblong, pinnately lobed or pinnately parted in fewer, subobtusate lobes and 0.6–3.0 mm long and 2–3 mm wide lobules; few cauline leaves sessile or subsessile, strongly reduced, pinnately parted or pinnately lobed. Capitula solitary, on long, more or less tomentose peduncles. Involucre 8–13 mm in dia and 4–6 mm long, adpressed-hairy; involucre bracts coriaceous-herbaceous, outer deltoid-lanceolate, inner 1.5–2 times as long, linear-lanceolate; all bracts with rather wide, brownish membranous border. Ligulate florets white, corolla tube 1.2–1.5 mm long and limb 6–10 mm long and 2.5–4.5 mm wide; corolla
242 of tubular florets 2.6–3.2 mm long. Achenes 2.4–3 mm long and 0.6–0.8 mm wide, with 6–8 prominent ribs; corona 0.3–0.6 mm long, cut almost to base in irregularly toothed (with subulately pointed teeth) lobe of various shades and size, strongly reduced in achenes of ligulate florets, often completely absent. Flowering July to August.

Rocks and stony slopes above 2,000 m.—*Soviet Central Asia*: Pamiro-Alai (Hissar Range). Endemic. Described from Hissar Range. Type and isotypes in Leningrad.

39. **P. galae** M. Pop. in Tr. Turkest. Nauchn. Obshch. I (1923) 40; *Chrysanthemum galae* M. Pop. ibid. 41, nom. altern.—*Tanacetum galae* (M. Pop.) Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, IV (1937) 216.—**Ic.**: M. Pop. l. c. t. 6.

Perennial. Plants 20–50 cm high, with thick woody rhizome, usually covered with adpressed and erect bifid hairs, mixed with simple. Stems usually rather numerous, less often solitary, arising from branches of

more or less woody caudex, weakly leafy, simple or with few (1–5) branches, arising from axils of cauline leaves. Leaves dull green from rather dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves 8–10 cm long and up to 2(2.5) cm wide, on rather long (but shorter than lamina) petiole, strongly thickened at base; lamina oblong or lanceolate-oblong, cuneately narrowed toward base, irregularly pinnately parted (less often lobed); leaf segments 3–6 on each side, oblong or lanceolate, usually with large irregular teeth or pinnately lobed; few cauline leaves strongly reduced, sessile or subsessile, usually pinnately lobed. Capitula solitary or 2–6 on long, more or less pubescent peduncles, not in regular corymbs. Involucre 6–10 mm in dia and 6–8 mm long, more or less pubescent; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, inner 1.5–2 times as long, ovate-oblong; all bracts with narrow, brownish membranous border, appendiculately broadened at apex in inner bracts. Ligulate florets white, corolla tube 1.0–1.5 mm long, and limb 8–12 mm long and 2.5–4.0 mm wide; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.5–3.2 mm long, 0.7–1 mm wide, with 6–8 longitudinal ribs; corona 0.2–0.3 mm long, cut almost or right to base into acute lobes of various shape and size; achenes of ligulate florets with shorter, usually unilateral corona. Flowering June to July.

Sandstone and limestone rocks, dry gypsic hills in lower and middle mountain zone.—*Soviet Central Asia*: Pamiro-Alai (western part of 243 Hissar Range). Endemic. Described from Hissar Range (Baisuntau Mountain). Type in Tashkent; isotype in Leningrad.

40. **P. mikeschinii** Tzvel. sp. nova. in Addenda, XXV, 873.

Perennial. Plants 20–30 cm high, with thick woody rhizome, grayish from rather dense pubescence of semi-erect bifid (mixed with simple) hairs. Stems usually rather numerous, less often solitary, erect or ascending, weakly leafy branched only near more or less woody base. Leaves grayish-green from rather dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves up to 10 cm long and 1.3 cm wide, on rather long (but shorter than lamina) petiole, strongly thickened at base and almost coriaceous; lamina broadly linear, but pinnately cut almost up to wingless axils; leaf segments oblong, sessile or subsessile, more or less pinnately parted, sometimes partly entire or pinnately lobed; terminal lobes linear-lanceolate, up to 1.2 mm wide, narrowed into cartilaginous cusp; few (3–5) cauline leaves strongly reduced, middle and upper sessile. Capitula solitary, on long, densely hairy peduncle. Involucre 6–8 mm in dia and 5–7 mm long, sparsely tomentose near base; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, inner 1.5–2 times as long, oblong-lanceolate; all bracts

with rather wide, brownish, membranous border, somewhat broadened at apex in inner bracts. Fully developed ligulate and tubular florets lacking (plant was collected before flowering). Mature achenes unknown; corona usually about 0.2 mm long, lobed almost to base. Flowering June to July.

Stony slopes, steppes above 2,000 m.—*Soviet Central Asia*: Pamiro-Alai (Turkistan Range). Endemic. Described from Turkistan Range, upper reaches of Isfara River 50 km south of the village of Vorukh, northern slope in valley of tributary of Dzhityk above mouth of Tamingen River, sheep's fescue steppe, about 2,900 m (22. VI. 1938, No. 58, G. Mikeshin). Type in Leningrad.

Note. Like the previous species, this species does not show close affinity with other species. Morphologically, it slightly resembles *Pyrethrum pyrethroides* of section *Richteria*. However, the nature of the pubescence and the less dissected leaves, almost flat receptacle, and more or less woody branches of the caudex compel us to consider it much closer to the species of section *Brachyglossa*, especially *P. hissaricum* and *P. galae*. The only two specimens of this species at our disposal, from almost the same locality, were collected before flowering; as a result, the details of floral and achene structure cannot be established precisely.

41. **P. semenovii** (Herd.) Winkl. ex O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 186.—*Tanacetum semenovii* Herd. in Bull. Soc. 244 Nat. Mosc. XL, 1 (1867) 130.—*Chrysanthemum semenovii* (Herd.) B. Fedtsch. Rast. Turk. (1915) 737.

Perennial. Plants 10–35 cm high, with thick many headed rhizome, grayish or even whitish from extensive loose tomentum of simple flexuous hairs. Stems usually numerous, arising from more or less woody branches of caudex, erect or ascending at base, weakly leafy, simple. Leaves grayish or whitish-tomentose, with few distinct punctate-glandular hairs; basal leaves usually up to 4 cm long and 0.8 cm wide, less often (in shady specimens) up to 10–12 cm long and 2 cm wide, on rather long (but shorter than lamina) petiole, strongly thickened at base and with patches of axillary tomentum; lamina of basal leaves oblong to oblong-linear, pinnately cut; leaf segments rather numerous, sessile or short-petiolate, oblong, usually pinnately lobed or parted, with few short lobes or segments up to 1.0–1.5 mm wide, subacute; few (1–3) cauline leaves strongly reduced, sessile, more or less pinnately parted to entire. Capitula solitary (but numerous on a single plant), on long tomentose peduncles. Involucre 7–11 mm in dia and 5–7 mm long, more or less loosely tomentose; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, inner 2–3 times as long, oblong;

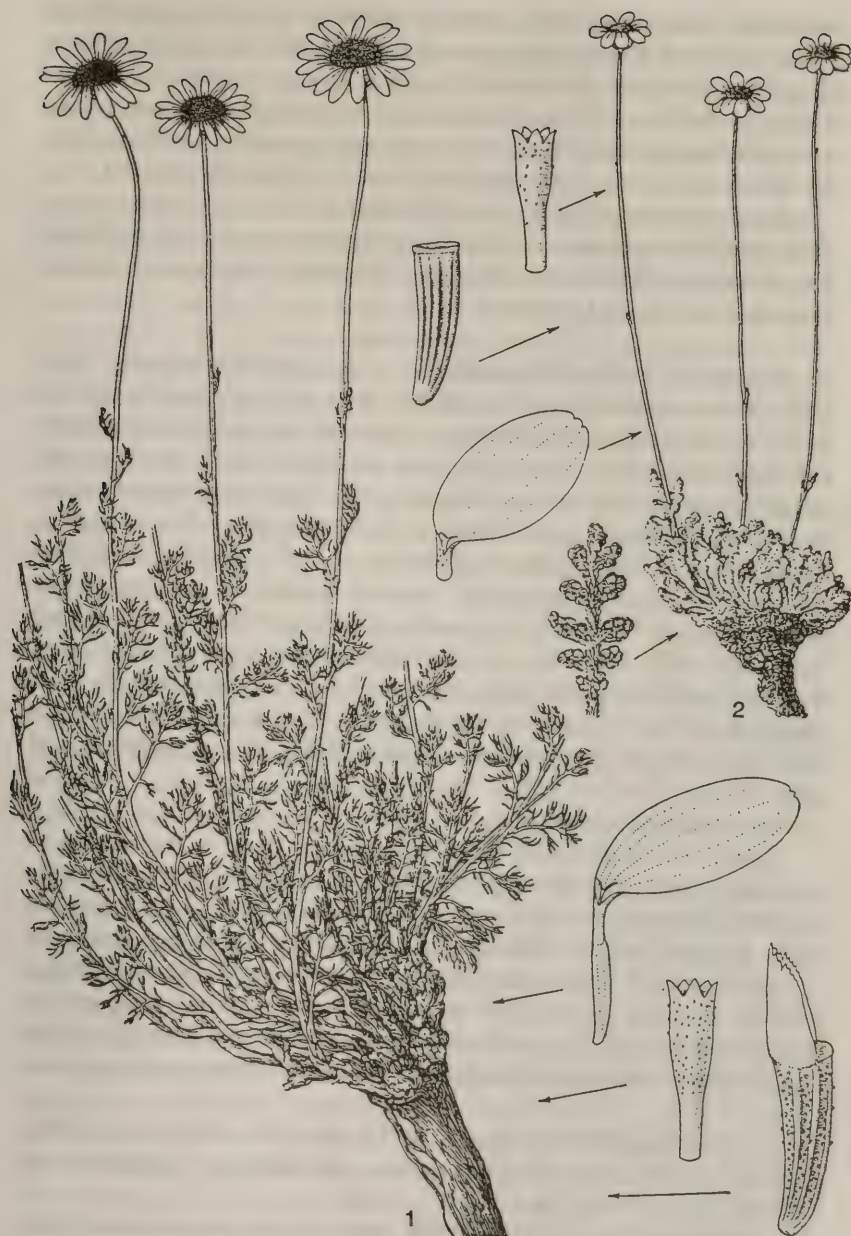


Plate X.

1 — *Spathipappus griffithii* (Clarke) Tzvel., habit of plant, ligulate floret, corolla of tubular floret, and achene; 2 — *Pyrethrum semenovii* (Herd.) Winkl. ex O. and B. Fedtsch., habit of plant, leaf, corolla of ligulate floret, corona of tubular floret, and achene.

all bracts with rather wide erose-toothed light brown membranous border. Ligulate florets white or pink, corolla tube about 1.2–1.5 mm long, limb 6–10 mm long and 2.5–4.0 mm wide; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.3–3.0 mm long, 0.6–0.8 mm across, with 6–8 longitudinal ribs and more or less irregularly toothed, 0.2–0.6 mm long corona. Flowering June to July. (Plate X, Fig. 2.)

Rocks and stony slopes in middle mountain zone.—*Soviet Central Asia*: Tien Shan (Ketmen and Trans-Ili Alatau ranges), Lake Balkhash Region (Syugaty Mountains). Endemic. Described from Trans-Ili Alatau. Type and isotype in Leningrad.

Section 13. *Trichanthemopsis* Tzvel. sect. nova in Addenda, XXV, 872.—Plants more or less woody at base, 6–25 cm high, usually covered with erect simple hairs or completely glabrous, with weakly leafy stems and well developed, short (but often elongated base) nonflowering
245 shoots. Leaves more or less pinnately cut, with very narrow lobes; basal leaves petiolate, cauline sessile. Capitula solitary (but several on single plant); involucre narrow-patelliform, 10–16 mm in dia; receptacle strongly convex, hemispherical; limb of corolla in ligulate florets oblong-oval, 6–15 mm long; corolla of tubular florets 2.5–3.2 mm long, with tube somewhat gradually broadened in upper half, with deltoid, weakly recurved teeth. Achenes 2.5–3.5 mm long, with 5–10 longitudinal ribs; corona 1.2–2.5 mm long, almost or to base divided into 6–10 more or less toothed scales or lobes of various shape and size.

A monotypic section.

Note. The single species of this section is close to the species of the next section, *Richteria*, in many respects, differing from them only by the more or less woody bases of the branches. However, it is equally close to some species of the genus *Trichanthesis* Rgl. and Schmalh. (*T. butkovii* and *T. litwinowii*), and only the completely glabrous achenes provide a basis to place it in the genus *Pyrethrum* and not in *Trichanthesis*. The dual, not entirely clear taxonomic position of this species is the main reason for placing it in a separate monotypic section.

42. *P. tianschanicum* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1.1 (1933) 176.—*P. pyrethroides* var. *glabrum* B. Fedtsch. ex Krasch. ibid. 176, in syn.

Perennial. Plants 6–25 cm high, with thick woody rhizome, more or less pubescent, often completely glabrous. Stems numerous from branched, more or less woody caudex, usually caespitose with short (but with elongate base) nonflowering shoots, erect or ascending near base, sparsely leafy mainly in lower part, simple. Leaves green, less

often pubescent to completely glabrous, lacking distinct punctate-glandular hairs; basal leaves 5–8 cm long and up to 1.0–1.5 cm wide, on rather long (but shorter than lamina) petioles strongly thickened at base; lamina oblong-linear to oblong, pinnately cut; leaf segments gradually reduced toward lamina base, in turn more or less palmately cut into linear-filiform (0.2–0.4, less often up to 0.6 mm wide), 2–10 subacute lobes; cauline leaves strongly reduced, sessile, often pinnately cut. Capitula solitary, on rather long, more or less pubescent peduncle, but usually numerous on a single plant. Involucre 10–16 mm in dia, 5–8 mm long, more or less pubescent at base, often with fine tomentum; involucre bracts coriaceous-herbaceous, outer lanceolate, inner 1.5–2 times as long, oblong-linear; all bracts with rather wide, brownish or dark-brown membranous border. Ligulate florets white, corolla tube 1.5–2 mm long, limb 6–15 mm long; corolla of tubular florets 2.5–3.2 mm long. Achenes 2.5–3.5 mm long and 0.6–0.8 mm wide with 6–10 longitudinal ribs; corona 1.2–2.5 mm long, almost or right up to base divided in 6–10 oblong or linear-oblong scales, irregularly toothed at apex. Flowering July to August. (Plate IX, Fig. 1.)

Rocks and stony slopes 2,000 m.—*Soviet Central Asia*: Tien Shan (Ugam, Pskem and Talass Alatau ranges). Endemic. Described from Talass Alatau. Type in Leningrad.

Note. The only specimen in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, from the Pskem River Basin (upper reaches of Ispap-Sai, subalpine zone, 1940, No. 24, O. Knorring) has less dissected leaves (pinnatisect, with more or less lobate segments) with broader lobes and, perhaps, belongs to a unique ecogeographical race.

Section 14. *Richteria* (Kar. and Kir.) Tzvel. comb. nova.—*Richteria* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 126.—*Chrysanthemum* sect. *Richteria* (Kar. and Kir.) Clarke, Compos. ind. (1876) 146 p. p.; B. Fedtsch. Rast. Turk. (1915) 737.—*C.* sect. *Pyrethrum* subsect. *Richteria* (Kar. and Kir.) Ling in Contr. Inst. Bot. Nat. Acad. Peiping, III(1935) 480.—Herbaceous plants, (3)8–40(70) cm high, usually covered with rather long and short simple hairs, sometimes completely glabrous, with weakly leafy stem and well-developed short, nonflowering shoots. Leaves more or less (usually twice) pinnately cut, with very narrow lobes, lower petiolate, middle and upper sessile. Capitula solitary, less often 2–8 on a single stem, and then usually not in regular corymbs; involucre patelliform or narrow-patelliform, 8–25 mm in dia; receptacle strongly convex, hemispherical; corolla limb of ligulate florets oblong-ovate, broadly linear and linear, 7–25 mm long; corolla of tubular florets 2.0–3.5 mm long, with somewhat gradually (rarely abruptly) broadened tube in

upper half and weakly recurved deltoid teeth. Achenes 1.8–3.0 mm long, with 5–10 longitudinal ribs; corona 0.3–1.5 mm long, usually cut to or almost to base (less often up to middle) in lobes or scales of various shape and size, more or less corresponding to number of ribs.

Type of section: *Pyrethrum pyrethroides* (Kar. and Kir.) B. Fedtsch. ex Krasch.

Note. It is one of the largest sections of the genus, comprising about 25–30 species distributed in mountainous regions of Central and Soviet Central Asia as well as in some regions of southern Siberia. The species in this section divide themselves in two groups, which perhaps deserve sectional rank: *Richteria* proper (series *Pyrethroides*, 249 almost always with a longer achene corona cut to or almost to base, and the species with a more northern and northeastern range which are larger on the average, with a shorter and usually also less dissected achene corona, in habit strongly resembling species of the genus *Tripleurospermum* Sch. Bip. However, a sharp morphological boundary cannot be drawn between these groups, and, besides, there is reason to consider the second group the progenitor of the species of the first group, which, itself, apparently, appeared as a result of adaptation to high-mountain conditions combined with a significantly dry climate. The relationship of this section to other sections of the genus is quite clear, and splitting it off as a separate genus would hardly be justified.

Series 1. *Abrotanifolia* Tzvel.—Plants 25–70 cm high, with thrice pinnately cut (rarely partly twice pinnately cut) lamina of basal leaves. Capitula 1–8 on a single stem. Corona of achenes 0.3–1.0 mm long, irregularly toothed or lobate usually not more than to middle, less often almost to base.

43. ***P. alatavicum*** (Herd.) O. and B. Fedtsch. in Perech. Rast. Turk. IV (1911) 186; Kryl. Fl. Zap. Sib. XI, 2748.—*Tanacetum alatavicum* Herd. in Bull. Soc. Nat. Mosc. XL, 2 (1867) 129.—*Chrysanthemum alatavicum* (Herd.) B. Fedtsch. Rast. Turk. (1915) 737.—Exs.: GRF No. 3263.

Perennial. Plants 25–70 cm high, with more or less thick oblique rhizome, sparsely covered with long, simple and short glandular hairs, sometimes glabrous. Stems few or solitary, erect, more weakly leafy, usually more or less branched above, less often simple. Leaves green, more or less pubescent to glabrous, lacking punctate-glandular hairs; basal and lower cauline leaves up to 18–20 cm long and 4 cm wide, on rather long (but shorter than lamina), petioles strongly thickened at base; lamina linear-oblong, 3- or partly twice pinnately cut, with 7–12 segments on each side; terminal segment linear-filiform to linear-

lanceolate, up to 1 mm wide, gradually narrowed into rather long cusp; other cauline leaves smaller and with shorter, less dissected lamina, sessile. Capitula usually 2–6, on long, more or less pubescent peduncles, in axils of upper cauline leaves, usually not forming regular corymb. Involucre 10–18 mm in dia, 4.5–6 mm long, more or less pubescent to subglabrous; involucre bracts herbaceous, outer linear or linear-lanceolate, inner 1.5–2 times as long, oblong-linear; all bracts with rather wide, blackish-brown membranous border. Ligulate flortest white, corolla tube 1–2 mm long, limb 14–22 mm long, perhaps, less often bearing fruits; corolla of tubular florets 2–3 mm long. Achenes 2.2–3.2 mm long and about 0.8 mm wide, with 5–7 longitudinal ribs; corona 0.5–1.0 mm long, cut almost to base in irregularly toothed lobes or scales. Flowering July to August.

Stony slopes, meadows above 2,500 m.—*Western Siberia*: Altai (southwestern part); *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan (central part and Chatkal Range), Pamiro-Alai (Alai Range). *General distribution*: Dzhungaria-Kashgaria. Described from Trans-Ili Alatau. Type in Leningrad.

44. ***P. krylovianum*** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 155; Kryl. Fl. Zap. Sib. XI, 2746.—*Chrysanthemum abrotanifolium* (Bge.) Kryl. Fl. Alt. III (1904) 621 p. p.—**lc.**: Krasch. op. cit. 156, Fig. 1.

Perennial. Plants 25–70 cm high, with more or less thick oblique rhizome, sparsely covered with long, simple hairs, mixed with shorter glandular hairs, sometimes completely glabrous. Stems few or solitary, erect, more weakly leafy, usually simple, less often with 1–2 lateral branches. Leaves like previous species but, on the average, narrower. Capitula solitary, less often 2–3 on a single stem, on long peduncle in axils of upper leaves. Involucre 10–18 mm in dia, 4.5–6.0 mm long, more or less pubescent or subglabrous; involucre bracts like previous species. Ligulate florets white, corolla tube 1–2 mm long, limb 14–25 mm long; corolla of tubular florets about 2.5 mm long. Achenes 2–3 mm long and about 0.8 mm wide, with 5–7 longitudinal ribs and more or less toothed 0.4–0.7 mm long corona. Flowering July to August.

Stony slopes and rocks of upper mountain zone.—*Western Siberia*: Altai (mainly northern and western parts). Endemic. Described from Altai. Type and isotype in Leningrad.

Note. It differs from the previous species in only one, not always consistent character; the capitula are almost always solitary, which, with the isolated range, can still serve as a basis for segregating *P. krylovianum* as a separate, though morphologically very weakly isolated, race.

45. **P. abrotanifolium** Bge. ex Ldb. Fl. Ross. II (1844–1846) 549, non Pourr. ex Willk. and Lge. 1870; Kryl. Fl. Zap. Sib. XI, 2747.—*Chrysanthemum abrotanifolium* (Bge.) Kryl. Fl. Alt. III (1904) 621 p. p.

Perennial. Plants 25–45 cm high, with thick oblique rhizome, usually covered with very short, glandular and long, flexuous, simple hairs, sometimes subglabrous. Stems few or solitary, erect, more sparsely leafy, with 2–8 lateral branches mainly in upper half. Leaves like previous species, but more densely hairy, usually with predominance of short glandular hairs. Capitula usually 2–8, solitary at apices of main stem and its lateral branches, not forming regular corymb, less often solitary. Involucre 8–12 mm in dia, 4–6 mm long, more or less pubescent at base; involucre bracts herbaceous, outer lanceolate and linear-lanceolate, inner 1.5–2 times as long, oblong-linear; all bracts with rather wide, brownish or dark brown, membranous border. Ligulate florets white, corolla tube 0.8–1 mm long, limb 7–12 mm long; corolla of tubular florets about 2 mm long. Achenes 1.5–2.3 mm long, with 5–7 longitudinal ribs; corona 0.3–0.5 mm long, irregularly toothed or lobed to middle or slightly deeper. Flowering July to September.

Stony slopes, meadows at 2,000–3,500 m.—*Western Siberia*: Altai (rarely); *Soviet Central Asia*: Dzhungaria-Tarbagatai. *General distribution*: Dzhungaria-Kashgaria (?). Described from Altai. Type and isotype in Leningrad.

Note. It differs from the previous species by having smaller and more numerous capitula, as well as denser pubescence.

Series 2. Pulchella Tzvel.—Plants 10–30 cm high; lamina of basal leaves pinnately cut, with entire or 2–4-parted segments; capitula solitary, less often 2–3 on a single stem; corona of achenes 0.3–0.6 mm long, irregularly toothed or lobed up to middle or almost to base.

46. **P. pulchellum** Turcz. in DC. Prodr. VI (1837) 55; Ldb. Fl. Ross. II, 548; Turcz. Fl. baic.-dahur. II, 46.—*P. pectinatum* Fisch. ex Turcz. in Bull. Soc. Nat. Mosc. I (1838) 94, nom. nud.—*Tanacetum pulchellum* (Turcz.) Sch. Bip. Tanacet. (1844) 61.

Perennial. Plants 10–30 cm high, with more or less branched, creeping rhizome, usually covered with long flexuous hairs, often subglabrous. Stems solitary or few, erect or ascending at base, more or less hairy in upper part, weakly leafy, simple, less often with 1–2 lateral branches. Leaves green, glabrous, less often pubescent, lacking punctate-glandular hairs; basal and lower cauline leaves 8–10 cm long, and up to 1.5–2 cm wide, on rather long (but shorter than lamina),

more or less winged petiole, strongly thickened at base; lamina oblong or linear-oblong, pinnately cut; leaf segments 6–15 on each side, entire, narrow-linear (up to 1 mm wide), acuminate, or 2–4 parted in similar lobes; middle and upper cauline leaves strongly reduced, sessile, usually with entire segments. Capitula solitary, less often 2–3 on a single stem; peduncles long, more or less sparsely tomentose. Involucre 10–15 mm in dia, 4.0–5.5 mm long, usually covered with whitish tomentum at base; involucre bracts herbaceous, outer lanceolate-ovate, inner 1.5–252 2 times as long, broadly linear; all bracts with very wide, blackish-brown membranous border. Ligulate florets white, corolla tube about 1 mm long, limb 7–14 mm long, usually sterile because of partly abortive pistil; corolla of tubular florets 1.8–2.4 mm long. Achenes 2.2–2.6 mm long and 0.6–0.7 mm wide, with 5 (rarely up to 7) longitudinal ribs; corona 0.3–0.6 mm long, irregularly toothed and lobed up to middle or almost up to base. Flowering July to August.

Stony slopes, bald peaks, grassy patches, in upper mountain zone.—*Western Siberia*: Altai (northeastern part); *Eastern Siberia*: Angara-Sayans, Dauria. *General distribution*: Mongolia (northern part). Described from Lake Baikal Region. Type and isotypes in Leningrad.

Note. The very strong morphological resemblance of this species to those of *Tripleurospermum* Sch. Bip. extends partly also to the structure of the achenes in the ligulate florets (when developed), which have prominent, almost winged ribs.

Series 3. Pulchra Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 158.—Plants 5–35 cm high. Lamina of basal leaves twice pinnately cut; cauline leaves pinnately cut, with entire or 2–5 parted segments. Capitula solitary, large, less often 2–3 on a single stem. Corona of achenes 0.3–1.2 mm long, irregularly toothed or lobed up to middle or almost to base.

47. ***P. lanuginosum*** (Sch. Bip. and Herd.) Tzvel. comb. nova.—*Tanacetum lanuginosum* Sch. Bip. and Herd. in Pollichia, XX–XXI (1863) 442.

Perennial. Plants 10–30 cm high, with more or less branched creeping rhizome, more or less lanate-tomentose with flexuous simple hairs. Stems solitary or few, but often caespitose together with short nonflowering shoots, erect, simple, less often with 1–2 lateral branches. Leaves usually dull or even grayish-green from rather extensive, somewhat loose tomentum, but often sparsely hairy or subglabrous, lacking punctate glandular hairs; basal leaves 10–15 cm long and 1.5–2.0 cm wide, on rather long, more or less winged petiole, strongly thickened at base and usually (but not always) lanate-tomentose in leaf

axils; lamina linear or oblong-linear, narrowed at both ends, pinnately cut; leaf segments 7–20 on each side, approximate, sessile or subsessile, in turn pinnately cut or parted; terminal segments narrow-linear and lanceolate-linear, up to 0.6 mm wide, gradually narrowed toward apex into rather long cartilaginous cusp; cauline leaves smaller, usually less dissected and more densely hairy, sessile or subsessile. Capitula
 253 solitary, very rarely 2–3 on a single stem; peduncles rather long, thickened toward apex and covered with extensive lax tomentum. Involucre 15–28 mm in dia and 5–7 mm long, usually covered, almost all over with lax whitish tomentum; involucre bracts herbaceous, outer lanceolate-linear, inner 1.5–2 times as long, oblong-linear; all bracts with very wide, blackish-brown, membranous border. Ligulate florets white, corolla tube 2–2.5 mm long, limb 13–25 mm long narrow-linear, often sterile; corolla of tubular florets 3–3.5 mm long. Achenes 2–3 mm long and about 0.8 mm wide, with 5–8 longitudinal ribs; corona 0.4–0.8 mm long, usually irregularly toothed on margin not beyond middle. Flowering July to August.

Stony slopes, bald peaks in upper mountain zone.—*Eastern Siberia*: Angara-Sayans (southeastern part). *General distribution*: Mongolia (northern part). Described from the eastern Sayan Range (Munku-Sardyk Mountain). Type (or isotype?) in Leningrad.

Note. The widely distributed, weakly pubescent individuals of this species may constitute a special ecogeographical race, which is more or less intermediate between this and the next species.

48. **P. pulchrum** Ldb. Ic. pl. Fl. Ross. impr. Alt. I (1829) 20, t. 84 and Fl. Alt. IV (1833) 118; DC. Prodr. VI, 56; Ldb. Fl. Ross. II, 548; Kryl. Fl. Zap. Sib. XI, 2745.—*Tanacetum pulchrum* (Ldb.) Rupr. in Osten-Saken and Rupr. Sert. tiansch. (1869) 52, quoad nom.—*Chrysanthemum pulchrum* (Ldb.) Winkl. in Tr. Peterb. Bot. Sada, X (1884) 87.—**Ic.**: Ldb. op. cit. (1829) tab. 84.—**Exs.**: GRF No. 3264.

Perennial. Plants 10–30 cm high, with more or less branched creeping rhizome, covered with flexuous simple hairs. Stems solitary or few, but often caespitose together with short nonflowering shoots, erect or ascending near base, simple, less often with 1–2 lateral branches, weakly leafy. Leaves green, glabrous, or subglabrous, less often covered with fine, somewhat sparse tomentum, lacking distinct punctate-glandular hairs; basal leaves 10–15 cm long, and 1.5–2 mm wide, on rather long, more or less winged petiole, always lacking tomentum at their base; lamina of basal leaves like previous species, but their segments, on the average, less divided (usually 2–5-parted), with broader (up to 1 mm wide) apical lobes; cauline leaves even more reduced than in previous species, sessile, often with entire segments.

254 Capitula solitary, very rarely 2-3 on single stem, on long peduncles, more or less thickened upward and sparsely tomentose. Involucre 15-28 mm in dia and 5-7 mm long, covered with extensive lax tomentum near base; involucre bracts like previous species. Ligulate florets white, corolla tube 2-2.5 mm long, limb 12-25 mm long, linear, on the average, broader than in previous species; corolla of tubular florets 3-3.5 mm long. Achenes 2-3 mm long and about 0.8 mm wide, with 5-8 longitudinal ribs; corona 0.6-1.2 mm long, usually irregularly toothed and lobed on margin up to middle. Flowering July to August.

Stony slopes, grassy patches in upper mountain zone.—*Western Siberia*: Altai. *General distribution*: China (northwestern part), Mongolia (western part). Described from Altai. Type and isotypes in Leningrad.

Note. One specimen of this species in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR (the former Oirot Autonomous Region, source of Kanas River, 2.VIII.1931, B. Schischkin, L. Chilikina, G. Sumnevich) has a strongly tomentose pubescence on the entire plant and, possibly, belongs to a special ecogeographical race. It differs from the previous species in the cutting of the leaves.

49. *P. karelinii* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 157.—*P. pulchrum* auct. non Ldb.; O. and B. Fedtsch. Perech. Rast. Turk. VI (1911) 186.—*P. richterioides* var. *virescens* (Winkl.) O. and B. Fedtsch. ibid. 186.—*Chrysanthemum richterioides* var. *virescens* Winkl. in Tr. Peterb. Bot. Sada, X (1887) 86.—*C. richterioides* auct. non Winkl.: B. Fedtsch. Rast. Turk. (1915) 736.

Perennial. Plants 5-35 cm high, with more or less branched, creeping rhizome, usually covered with long, flexuous simple hairs. Stems rather numerous, less often solitary, usually caespitose together with short nonflowering shoots; erect or ascending at base, weakly leafy, simple. Leaves green or dull green (to almost grayish) from usually sparse pubescence with or without inconspicuous punctate-glandular hairs; basal leaves 8-12 cm long and 1-2.5 cm wide, on rather long, basally thickened petiole, always lacking tomentum in their axils; lamina of basal leaves oblong or oblong-linear, pinnately cut; leaf segments sessile or subsessile, pinnately parted or sometimes almost palmately parted into 5-15 lobes; terminal segments linear or lanceolate-linear, up to 1 mm wide, subacute; cauline leaves strongly reduced, sessile or subsessile, usually more or less adpressed to stem, often with entire segments. Capitula solitary, on rather long, sparsely tomentose peduncles. Involucre 13-25 mm in dia and 5-7 mm long, more or less tomentose near base; involucre bracts like previous

species. Ligulate florets white or pinkish-white, corolla tube 1.5–2.0 mm long, limb 12–20 mm long, broadly linear; corolla of tubular florets 2–3 mm long. Achenes 2.0–2.5 mm long, with 5–8 longitudinal ribs; corona 0.3–0.6 mm long, cut up to middle or almost up to base in
 255 obtuse irregularly toothed lobes more or less corresponding to ribs. Flowering July to August.

Stony slopes, grassy patches above 3,000 m.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau), Tien Shan (except southwestern part), Pamiro-Alai (Alai and Trans-Alai ranges, northern Pamir). *General distribution*: Dzhungaria-Kashgaria. Described from Dzhungarian Alatau. Type and isotypes in Leningrad.

Note. Through transitional forms, it is connected to a very close eastern Tien Shan species—*P. richterioides* (Winkl.) Krassn. (Opyt Ist. Razv. Fl. Vost. Tyan-Shanya* (1888) 346.—*Chrysanthemum richterioides* Winkl. op. cit. 86, excl. var.), which differs mainly by having a more dense pubescence on the entire plant (grayish from thin tomentum) and pink-colored ligulate florets. In particular, specimens of *P. karelinii* are found in Dzhungarian Alatau and the mountains of Southeastern Kazakhstan, which do not differ from *P. richterioides* in their pubescence. The differences cited by Krasheninnikov between these species in the degree of the incision of the leaves, which, even on the average barely exist, and the persistence of its pink color of the flowers need verification.

Series 4. Pyrethroidea Tzvel.—*Richteria* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 126, sensu stricto.—Plants 3–35 cm high; lamina of basal leaves (usually also lower cauline leaves) twice pinnately cut; capitula solitary, less often 2–3 on single stem; corona of achenes 0.6–1.5 mm long, usually cut into lobes or scales almost to base, but sometimes not beyond middle.

50. ***P. songaricum*** Tzvel. sp. nova in Addenda, XXV, 874.—*P. pyrethroides* ssp. *songaricum* Krasch. in herb.

Perennial. Plants 15–35 cm high, with more or less branched rhizomes, grayish from extensive, loose tomentum of long and short simple hairs. Stems usually few, erect or ascending at base, weakly leafy, simple or with 1–3 lateral branches. Leaves grayish-green from dense tomentum, with inconspicuous punctate-glandular hairs; basal leaves up to 8–10 cm long, 3 cm wide, on rather long (usually not more than a half as long as lamina), basally thickened petiole; their

*Experiment of Historical Analysis of the Flora of the Eastern Tien Shan—Translator.

lamina broadly linear to linear-oblong, thrice pinnately cut with linear-lanceolate to lanceolate-ovate, up to 1 mm wide terminal segments with short cartilaginous cusp; cauline leaves smaller, sessile, usually twice pinnately cut. Capitula solitary or 2–4, on long, more or less tomentose peduncles, in axils of upper cauline leaves, not in corymbs. Involucre 10–18 mm in dia, 5–8 mm long, usually covered with fine grayish tomentum; involucre bracts herbaceous, outer lanceolate, inner usually not more than 1.5 times as long, linear-lanceolate; all bracts with rather wide, dark brown, membranous border. Ligulate florets white, corolla tube 1.5–2.0 mm long and limb; 8–14 mm long; corolla of tubular florets 2.5–3.2 mm long. Achenes 2.5–3.0 mm long and about 0.6 mm wide, with 6–8 longitudinal ribs; corona 1.0–1.5 mm long, usually irregularly toothed or lobed not beyond middle. Flowering June to August. (Plate VIII. Fig. 2.)

Stony slopes, rocks above 2,000 m.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau), Tien Shan (Kara Tau, Trans-Ili Alatau). *General distribution*: Dzhungaria-Kashgaria(?). Described from Dzhungarian Alatau. Type (Dzhungarian Alatau, Koksui River Basin near Kuvtas Mountain, 11.VIII.1948, V. Goloskokov) in Leningrad; isotype in Alma-Ata.

Note. This species, being, apparently, a comparative lower mountain ecogeographical race, differs from *P. pyrethroides* on the whole by having a more or less toothed or lobate corona, larger (on the average) size of the whole plant, and often branched stem.

51. *P. pyrethroides* (Kar. and Kir.) B. Fedtsch. ex Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, I (1933) 176; Kryl. Fl. Zap. Sib. XI, 2749.—*P. transiliense* var. *tomentosum* Rgl. and Schmalh. and var. *subsessile* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 618.—*Richteria pyrethroides* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 127; Ldb. Fl. Ross. II, 519; O. and B. Fedtsch. Perech. Rast. Turk. IV, 177 p. p.—*Chrysanthemum richteria* Benth. in Benth. and Hook. f. Gen. pl. II (1873) 426.—*C. artemisiaefolium* Klatt. in Sitz. Akad. Muench. (1878) 88.—*C. pyrethroides* (Kar. and Kir.) B. Fedtsch. Rast. Turk. (1915) 737.

Perennial. Plants 5–25(35) cm high, with more or less branched rhizome, grayish from extensive, loose tomentum of long and shorter simple hairs. Stems usually rather numerous, less often solitary, erect or ascending, weakly leafy, simple, very rarely with 1–2 lateral branches. Leaves grayish-green from extensive tomentum, with inconspicuous punctate-glandular hairs; basal leaves 6–8 cm long, 1.5 cm wide, on rather long (but usually less than a half as long as lamina) petioles, strongly thickened at base; their lamina oblong, twice pinnately

cut with lanceolate-linear to lanceolate-ovate, up to 1 mm wide terminal lobes with short cartilaginous cusp, in turn sometimes 2–4 parted; few cauline leaves smaller and less incised, sessile or subsessile. Capitula solitary, very rarely 2–3 on long, more or less tomentose peduncle. Involucre 7–15 mm in dia and 4–6 mm long, usually covered with somewhat loose tomentum; involucre bracts herbaceous, outer lanceolate, inner 1.5–2 times as long, oblong-linear; all bracts with wide blackish-brown, membranous border. Ligulate florets white or pink, corolla tube 1.3–2.0 mm long and limb 7–15 mm long; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.5–3.2 mm long, about 0.8 mm wide, with 5–9 longitudinal ribs; corona 0.8–1.5 mm long, cut up to base in oblong or linear-oblong, toothed scales, usually corresponding to number of ribs. Flowering July to August.

Stony slopes, rocks, screes, gravel beds in upper mountain zone.—*Western Siberia*: Altai (Kurai Range), Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region. *General distribution*: Dzhungaria-Kashgaria, Tibet, India-Himalayas (northern part), Iran-Afghanistan (northeastern part). Described from Dzhungarian Alatau. Type and isotypes in Leningrad.

Note. This widely distributed species, even after the separation of several ecogeographical races from it, apparently, continues to be an aggregate species, strongly varying in the form and incision of the leaves, pubescence, length of the corona, etc.

52. **P. neglectum** Tzvel. sp. nova. in Addenda XXV, 874.

Perennial. Plants 12–30 cm high, with more or less branched rhizome, whitish or grayish from very dense somewhat loose tomentum of long, flexuous, simple hairs. Stems usually rather numerous, less often solitary, erect or ascending at base, sparsely leafy, simple or with 1–2 branches, in axils of cauline leaves. Leaves more densely tomentose than in previous species, almost whitish from tomentum, with inconspicuous punctate-glandular hairs; basal leaves 8–10 cm long, 2.5 cm wide, on rather long (often almost as long as lamina), basally thickened petiole; their laminae oblong-oval, thrice pinnately cut; terminal lobules lanceolate-linear to lanceolate-ovate, up to 0.6 mm wide, with short cartilaginous cusp; few cauline leaves smaller and less divided, lower short-petiolate, upper sessile. Capitula solitary or 2–3 on long tomentose peduncle. Involucre 7–12 mm in dia, 4–5 mm long, densely covered with somewhat loose tomentum, often covering membranous border of involucre bracts; involucre bracts herbaceous, outer lanceolate, inner 1.5–2 times as long, oblong-linear; all bracts with rather wide (but narrower than in previous species), brownish or dark brown, membranous border. Ligulate florets white or pinkish-white, corolla tube about 1.5 mm long and limb 6–10 mm long; corolla

of tubular florets 2.2–2.6 mm long. Achenes 1.8–2.3 mm long and 0.6–0.8 mm wide, with 6–8 longitudinal ribs; corona 0.6–0.8 mm long, lobed up to base in oblong scales, usually corresponding to number of ribs. Flowering June to August.

On rocks, stony slopes at 1,500–3,000 m.—*Soviet Central Asia*: Tien Shan (Chatkal and Fergana ranges), Pamiro-Alai Region (Alai and Trans-Alai ranges, northwestern Pamir). Endemic. Described from the southern slopes of Chatkal Range. Type (northern part of Fergana Valley, Kuldambes mountains near Lake Sary-Chilek, 17.VII.1908, V. Rovinsky) and isotype in Leningrad.

258 *Note*. Differs from the previous species by a more extensive (almost whitish) pubescence of the whole plant, narrower, usually brownish (and not blackish-brown), membranous border of involucre bracts, often almost covered by dense pubescence, longer petioles and other less distinct characters, apparently, representing a lower montane ecogeographical race adapted to the mountain ranges surrounding the Fergana Valley.

53. ***P. transiliense*** (Herd.) Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 618 p. p.—*P. transiliense* var. *subvillosum* Rgl. and Schmalh. l. c. ibid. 618.—*Tanacetum transiliense* Herd. in Bull. Soc. Nat. Mosc. XL, II (1867) 129.—*Chrysanthemum transiliense* (Herd.) Minkw. and Knorr. Rast. Chimkentsk. Uezda (1910) 112.—*Richteria pyrethroides* var. *subvillosa* (Rgl. and Schmalh.) O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 177.

Perennial. Plants 10–35 cm high, with thick, more or less branched rhizome, more or less covered with suberect simple hairs. Stems usually rather numerous, less often solitary, erect or ascending at base, weakly leafy, simple, very rarely with single branch. Leaves green or sordid green from sparse pubescence, usually subglabrous, with rather numerous, but not always conspicuous punctate-glandular hairs; basal leaves up to 10 cm long and 2 cm wide, on rather long (sometimes almost as long as lamina), petioles strongly thickened at base; their laminae oblong to oblong-linear, twice or thrice pinnately cut; terminal segments lanceolate to linear-filiform, usually up to 0.6–0.8 mm wide, with rather long cartilaginous cusp; few cauline leaves strongly reduced and less divided, sessile. Capitula solitary, very rarely 2, on long peduncle, usually hairy (to tomentose) at least in upper part. Involucre 7–15 mm in dia, 4–6 mm long, usually tomentose or hairy only near base; involucre bracts herbaceous, outer lanceolate, inner 1.5–2 times as long, oblong-linear; all bracts with wide, blackish-brown, membranous border. Ligulate florets white or pinkish-white, corolla tube 1.3–2.0 mm long and limb 7–15 mm long; corolla of tubular

florets 2.5–3 mm long. Achenes 2.0–2.5 mm long and 0.6–0.8 mm wide, with 6–8 longitudinal ribs; corona 0.6–0.8 mm long; cut almost up to base into scales or lobes of various shape and size. Flowering June to August.

Rocks, stony slopes, gravel beds above 2,000 m.—*Soviet Central Asia*: Tien Shan (Kirgizian, Fergana, Trans-Iliian Alatau, Ketmen, Kungei-Alatau and Terskei-Alatau ranges), Pamiro-Alai Region (rarely: Alai, Trans-Alai and Karategin ranges). *General distribution*: Dzhungaria-Kashgaria(?). Described from Trans-Ili Alatau. Type and isotype in Leningrad.

- 259 **Note.** The coincidence of the range of this species with that of *P. pyrethroides*, as in many other cases, is only apparent and related to the great diversity in the conditions of growth in montane regions and the different geology of the geographically very close montane areas. In reality, however, both species are never found together, which does not preclude the existence of populations with transitional features in places of contact.

54. ***P. arassanicum*** (Winkl.) O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 187.—*P. gracillimum* (Winkl. ex O. and B. Fedtsch.) O. and B. Fedtsch. ibid. 186, nom. nud.—*Chrysanthemum arassanicum* Winkl. in Tr. Peterb. Bot. Sada, XI (1890) 372.—*C. gracillimum* Winkl. ex O. and B. Fedtsch. l. c. in syn.: B. Fedtsch. Rast. Turk. (1915) 737, nom. nud.

Perennial. Plants 10–25(30) cm high, with more or less branched rhizome, entirely glabrous. Stems usually rather numerous, less often solitary, erect or ascending, weakly leafy, simple, less often with 1–2 lateral branches. Leaves glabrous, with inconspicuous punctate-glandular hairs; basal leaves 6–8 cm long, 1.5 cm wide, on rather long, petiole strongly thickened at base; their lamina oblong, twice or thrice pinnately cut; terminal segments linear-lanceolate to lanceolate-ovate, somewhat hard, up to 1 mm wide, with short cartilaginous cusp; few cauline leaves smaller and less divided, usually sessile. Capitula solitary, less often 2–3, on long glabrous peduncle. Involucre 7–15 mm in dia and 4–6 mm long, glabrous; involucre bracts like previous species. Ligulate florets white or pinkish-white, corolla tube 1.3–2.0 mm long and limb 7–15 mm long; corolla of tubular florets 2.5–3 mm long. Achenes like previous species but usually with larger, 0.6–1.0 mm long, corona. Flowering June to August.

Stony and rubbly slopes, rocks at 2,500–3,500 m.—*Soviet Central Asia*: Dzhungaria-Tarbagatai(?), Tien Shan, Pamiro-Alai. *General distribution*: Dzhungaria Kashgaria(?). Described from the Kirgizian Range. Type in Leningrad.

Note. This species, first described from nonflowering specimens, has a range more or less coinciding with that of *P. pyrethroides*, from which it differs by the complete absence of pubescence. However, it is a rarer species, not always found in the range of *P. pyrethroides*; besides, intermediates between these species are totally absent, in spite of the fact that both species often grow together on the same stony slope. *P. transiliense* could be considered as an intermediate species on the basis of pubescence; however, it has a more limited distribution, and its leaf blades generally are more divided than in *P. arassanicum* and *P. pyrethroides*. Therefore, we consider it more appropriate to accept *P. arassanicum* as a separate species, being a unique "twin-species" of *P. pyrethroides* (as in the case of *Waldheimia tomentosa* and *W. stoliczkae*, as well as in many other genera of the Compositae).

P. gracillimum, described by Winkler in the herbarium from specimens collected by Komarov from the Zeravshan Range, in my view does not differ from *P. arassanicum*.

55. **P. djilgense** (Franch.) Tzvel. comb. nova.—*P. transiliense* var. *glabra* Franch. Pl. Turkest. (1883) 85, t. 17.—*Chrysanthemum djilgense* Franch. in Bull. Mus. Hist. Nat. Par. II (1896) 345.—*Richteria pyrethroides* var. *djilgensis* (Franch.) O. Fedtsch. in Tr. Peterb. Bot. Sada, XXVIII, 1 (1908) 28; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 178.—**!c.**: Franch. l. c. (1883) t. 17

Perennial. Plants 3–15 cm high, with more or less branched rhizome, completely glabrous. Stem erect or ascending, weakly leafy, always simple. Leaves like previous species, but smaller and less cut up; basal leaves usually up to 4–5 cm long and 1 cm wide; their lamina pinnately cut, with segments pinnately cut to pinnately lobed. Capitula solitary. Involucre 7–12 mm in dia, 4–5 mm long, glabrous; involucre bracts like previous species. Ligulate florets white or pinkish-white, corolla tube 1.3–2 mm long and limb 7–12 mm long; corolla of tubular florets 2.5–3.0 mm long. Achenes like previous species. Flowering July to August.

Stony and rubbly slopes, gravel beds, rocks above 3,000 m.—*Soviet Central Asia*: Tien Shan, Pamiro-Alai Region. *General distribution*: Tibet, Iran-Afghanistan (northeastern part). Described from Pamir. Type in Paris.

Note. In comparison with the previous species, it is a higher montane ecogeographical race (or ecological form?), also adapted to drier regions and related to it through transitional forms.

56. **P. leontopodium** (Winkl.) Tzvel. comb. nova.—*Richteria leontopodium* Winkl. in Tr. Peterb. Bot. Sada, IX (1886) 421; O. and

B. Fedtsch. Perech. Rast. Turk. IV (1911) 178.—*R. leontopodioides* B. Fedtsch. in Izv. Russk. Geogr. Obshch. IV (1898) 15.—*Chrysanthemum leontopodium* (Winkl.) B. Fedtsch. Rast. Turk. (1915) 737.—**Exs.:** GRF No. 2776.

Perennial. Plants 3–15 cm high, with more or less branched rhizome, whitish from extensive, somewhat loose tomentum. Stems erect or ascending, usually rather numerous, caespitose together with short nonflowering shoots, weakly leafy, always simple. Leaves whitish from very dense tomentum, under which their outline is scarcely visible, with inconspicuous punctate-glandular hairs; basal leaves up to 4 cm long and 1.5 cm wide, on rather long (but always shorter than lamina) petiole thickened at base; their lamina oblong or obovate, 2–3-pinnately cut; terminal segments linear-lanceolate to oblong, up to 1 mm wide, with or without short cusp; cauline leaves strongly reduced and less divided, sessile. Capitula solitary, on rather long, densely whitish-tomentose peduncles. Involucre 10–20 mm in dia and 5.5–6.0 mm wide, covered with copious loose tomentum. Ligulate florets white, corolla tube 1.5–2.3 mm long and limb 9–15 mm long; corolla of tubular florets 3–4 mm long. Achenes 1.8–3.0 mm long and 0.7 mm wide, with 7–10 elongate ribs; corona 0.8–1.3 mm long, cut up to base into oblong scales, usually corresponding to number of ribs. Flowering July to August. (Plate IX, Fig. 2.)

Stony and rubbly slopes, rocks, gravel beds above 3,000 m.—*Soviet Central Asia*: Tien Shan (Kirgizian, Trans-Ilian Alatau, Kungei-Alatau, Terskei-Alatau ranges). Endemic. Described from the Kirgizian Range. Type in Leningrad.

Note. In spite of its unique “edelweiss-like” appearance, it hardly deserves separation as an independent species, as the dense tomentose pubescence is the only character distinguishing it from *P. pyrethroides*.

Economic Importance. A promising species for cultivation as an ornamental plant for alpine gardens.

GENUS 1529. *Spathipappus* Tzvel. Gen. Nov.^{1,2}

Tzvel. in Addenda, XXV, 875.

Capitula solitary or 2–5, one each at apices of elongate leafy branches, but always numerous on single plant almost at same height,

¹Treatment by N.N. Tzvelev.

²From Latin words: *spatha*—cover, and *pappus*—beard, named for the unique shape of the pappus of the achenes, which faintly resembles the inflorescence cover in aroids.

heterogamous, with 12–40 pistillate, always sterile (as a result of partially abortive pistil), ligulate ray florets, in one row, and numerous bisexual tubular disk florets. Involucre patelliform, 10–18 mm in dia and 4–6 mm long; involucre bracts herbaceous, imbricate, in 3–4 irregular rows; outer bracts lanceolate, subacute, with narrow, brownish or blackish-brown membranous border, inner broadly linear, 1.5–2 times as long, with wider membranous border. Receptacle weakly convex, glabrous, solid, weakly punctate-tuberculate. Corolla of ligulate florets white, tube strongly flattened but nonwinged 1.2–1.6 mm long and limb 7–10 mm long oval-oblong or oblong-linear; corolla of tubular disk florets yellow, 2.8–3.6 mm long, with narrow and rather long tube, in upper half is slightly and gradually broadening in 5 straight deltoid teeth, a seventh to a sixth as long as tube. Filaments thickened above; anthers lacking distinct basal appendages, but with lanceolate-ovoid subobtuse apical appendage; pollen grains roundish, spiny. Styles bifid with linear, truncate branches. Achenes of tubular florets glabrous, 3.0–3.5 mm long, about 0.5–0.6 mm wide, with 5–6 weak elongate ribs; pappus as entire, unilateral (dorsally up to base), apically more or less obtuse or truncate, 1.5–2.4 mm long corona; ovary of sterile ligulate florets connate with corolla base, at apex lacking corona or with only reduced corona.

Perennial plants usually covered with bifid and simple hairs, with thick many-branched woody root, usually lacking short nonflowering shoots, with numerous, densely leafy, simple or sparingly branched, erect stems, more or less woody at base, and alternate leaves with twice pinnately cut blades.

Besides the type species, possibly, this genus also includes the recently described species *S. porphyrostephanus* (Rech. f.) Tzvel. comb. nova [= *Chrysanthemum porphyrostephanum* Rech. f. in Koie and Rech. f. Symb. afghan. II (1955) 47] from Afghanistan with purple ligulate florets.

Type of genus: *Spathipappus griffithii* (Clarke) Tzvel.

Note. This genus differs quite well from *Pyrethrum* Zinn. by a unique structure of the pappus and the sterile ligulate florets whose corolla remains fused with the ovary lacking or almost lacking pappus, as well as in its growth characteristics. Not incidentally, both the authors who described the species *S. griffithii* under two different names (*Chrysanthemum griffithii* Clarke and *Matricaria spathipappus* Winkl.), indicated that it probably belongs in its own genus. In my opinion, the genus *Spathipappus* shows the closest affinity with *Xylanthemum* Tzvel., differing from it by the presence of ligulate florets, a patelliform involucre, and a weakly convex receptacle.

1. *S. griffithii* (Clarke) Tzvel. comb. nova.—*Chrysanthemum griffithii* Clarke, Compos. ind. (1876) 148.—*C. stoliczkae* auct. non Clarke: Hook. f. Fl. Brit. Ind. III (1881) 344 p. p.—*Matricaria spathipappus* Winkl. in Tr. Peterb. Bot. Sada, X (1887) 85; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 185.—*Pyrethrum griffithii* (Clarke) Buser in Boiss. Fl. or. Suppl. (1888) 299.

263 Perennial. Plants 15–45 cm high, with thick woody root, dull-green or grayish-green from rather dense pubescence of bifid and simple hairs. Stems numerous, arising from woody, strongly branched caudex, densely leafy, erect or somewhat arcuately bent, simple or with few lateral branches near base. Leaves dull-green or grayish-green from rather dense pubescence, with inconspicuous punctate-glandular hairs; lower cauline leaves up to 3–5 cm long and 1.5 cm wide, on short, basally thickened petiole or sessile with twice pinnately cut lamina, oblong-linear to oblong-ovate, terminal segments narrow-linear to linear-lanceolate, usually up to 1 mm wide, with short cartilaginous cusp; upper cauline leaves like lower, but usually less divided and smaller. Capitula solitary, less often 2–5 on a single stem, but always numerous on one plant. Involucre 10–18 mm in dia, 4–6 mm long, usually covered with fine tomentum at base and dorsally; involucre bracts with rather wide, blackish-brown, less often brownish, membranous border. Ligulate florets white, limb 7–10 mm long and limb 3–4 mm wide; corolla of tubular florets about 3 mm long. Achenes 3.0–3.5 mm long and about 0.5–0.6 mm wide; corona 1.5–2.4 mm long, cut to base on dorsal side, unilateral. Flowering July to August. (Plate X, Fig.1.)

Gravel beds, screes and slope prolongations; above 3,000 m.—*Soviet Central Asia*: Pamiro-Alai (excluding the Alai Range and eastern Pamir). *General distribution*: Afghanistan, India (northern part). Described from Afghanistan. Type in Calcutta or London.

Note. Due to Hooker's error (Hooker fil. l. c.), for a long time this species was identified with *Chrysanthemum stoliczkae* Clarke (l. c. 147), which is absolutely different from it. The isotype of this latter species is preserved in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR, which shows the closest affinity with the genus *Brachanthemum* DC., but apparently, deserves recognition as a separate genus together with a series of closely related Central Asian species (of the *Pyrethrum roylei* DC. type).

Plants of *S. griffithii* from the Darvaz Range differ by having much sparser pubescence of the whole plant, apparently, forming a unique, morphologically very poorly isolated ecogeographical race.

GENUS 1530. *Waldheimia* Kar. and Kir.^{1,2}

Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 125.—*Allardia* Decne. in Jacquem. Voyage Inde, Bot. IV (1844) 87.

264 Capitula solitary (but numerous on a single plant), heterogamous, with 5–20 pistillate sterile ligulate ray florets in one row, and numerous bisexual tubular disk florets. Involucre patelliform or narrow-patelliform, 10–20 mm in dia and 4–6 mm long; involucre bracts imbricate, in 3–4 irregular rows, herbaceous, with wide, blackish-brown, membranous border, outer lanceolate or oblong, inner oblong-linear, 1.5–2 times as long. Receptacle weakly convex, solid, lacking scales, very sparsely punctate-tuberculate. Corolla of ligulate florets white or pink, tube weakly flattened 3–6 mm long, and limb oval or oblong (up to linear-oblong) 7–15 mm long; corolla of tubular disk florets yellow, 3.0–5.5 mm long, tube narrow in lower half, strongly and rather abruptly campanulately broadened in upper half, with 5 lanceolate-deltoid recurved teeth, 1/7–1/5 as long as tube. Anthers lacking distinct basal appendage, but with broadly lanceolate obtuse apical appendage; pollen grains roundish, spiny. Styles bifid with linear, truncate, branches. All achenes similar (but often undeveloped in outer ligulate florets and then with strongly reduced pappus), glabrous or pubescent, 2.5–4.0 mm long (excluding pappus), narrow-prismatic, turbinate toward base, weakly curved, with 5–10 prominent longitudinal ribs (of which 5 usually more prominent), testa not mucilaginous on soaking and rather tightly enclosing achene; pappus 4–8 mm long, 1-seriate, of numerous (25–50), flattened, setaceous scales, usually connate at base in fascicles (usually as many as ribs). Perennial plants, usually covered with long simple hairs (to wholly glabrous), strongly branched at base, with numerous, procumbent or ascending, flowering and nonflowering branches, somewhat caespitose; leaves alternate, pinnate or lobate.

Of the 8 species of this genus, distributed in the mountainous regions of Soviet Central Asia from the Altai in the north to the Himalayan Mountains in the south, 5 are found in the USSR.

Type of genus: *Waldheimia tridactylites* Kar. and Kir.

Note. In spite of the unique structure of the pappus, the genus *Waldheimia* is very closely related to section *Richteria* (Kar. and Kir.) Tzvel. of the genus *Pyrethrum* Zinn and, to a lesser extent, to the genus *Trichanthemis* Rgl. and Schmalh. Apparently, the pappus lobes typical of section *Richteria* are divided again into numerous bristle-

¹Treatment by N.N. Tzvelev.

²Named after G.I. Fischer-Waldheim (1771–1855), President of the Moscow Society of Naturalists.



Plate XI.

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1 — *Waldheimia transalaica* Tzvel., habit of the plant, leaf, corolla of ligulate floret, corolla of tubular floret, and achene; 2 — *Trichanthemis radiata* Krasch. and Vved., habit of the plant, corolla of ligulate floret, corolla of tubular floret, and achene.

like scales resembling the pappus hairs of many other genera of composites.

267 The genus is divided into two very natural sections, among which *Waldheimia* undoubtedly is a derivative of *Allardia* adapted to the more severe conditions of very high mountains.

Economic Importance. Some species could possibly be used as ornamental plants in alpine gardens.

1. Leaves with pinnately parted or cut lamina; ligulate florets fertile, with normal pappus; achenes hairy; rarely glabrous. (Sect. *Allardia*.) 2.
- + Leaves spatulate, apically 3–5-lobed; ligulate florets sterile, with strongly reduced pappus; achenes glabrous. (Sect. *Waldheimia*) ... 4.
2. Leaves, green, glabrous 2. **W. stoliczkae** (Clarke) Ostenf.
- + Leaves grayish from sparse but more copious tomentum 3.
3. Achenes densely hairy up to base; leaves not lobed or with 1–3 strongly reduced lateral lobes in lower half 3. **W. transalaica** Tzvel.
- + Achenes more or less hairy to subglabrous only in upper half; leaves in lower half with reduced lateral lobes 1. **W. tomentosa** (Decne.) Rgl.
4. Plants wholly glabrous 4. **W. tridactylites** Kar. and Kir.
- + Capitula near base (and often also peduncles) sparsely tomentose ... 5. **W. glabra** (Decne.) Rgl.

Section 1. *Allardia* (Decne.) Tzvel. comb. nova.—*Allardia* Decne. l. c. pro parte.—Ligulate florets fertile, with normal pappus; achenes more or less hairy, less often glabrous. Plants up to 10–15 cm high; capitula on longer peduncles; leaves with pinnatipartite or pinnatisect lamina.

Type of section: *Waldheimia tomentosa* (Decne.) Rgl.

Note. All species of this section are closely related ecogeographical races.

1. **W. tomentosa** (Decne.) Rgl. in Tr. Peterb. Bot. Sada, VI (1879) 308; O. and B. Fedtsch. Perech. Rast. Turk. IV, 214.—*Allardia tomentosa* Decne. in Jacquem. Voyage Inde, Bot. IV (1844) 87, t. 95.—**Ic.:** Decne. l. c.; Blatter, Beaut. Flow. of Kaschmir, I, (1927) t. 30.

Perennial. Plants up to 10–15 cm high, with strongly branched creeping rhizome, grayish from loose but copious tomentum or long and flexuous simple hairs. Stems numerous, more or less caespitose,

basally covered with thin-coriaceous, brownish sheaths of strongly reduced lower leaves, simple, terminating into single pedunculate capitulum, usually exceeding upper leaves. Leaves 4–5 cm long and 1.2–1.6 cm wide, loosely tomentose, lacking punctate-glandular hairs, on short-winged petiole; lamina oblong to oblong-linear, twice (rarely once) pinnately parted up to broadly winged axis, with 5–10 lobes on each side, gradually reduced toward lower side, often reaching up to petiole base; terminal segments lanceolate to ovate, with oblong cusp. Involucre 1.2–2.0 cm in diameter, 4–6 mm long; involucre bracts tomentose basally and dorsally. Ligulate florets 10–20, fertile; corolla of ligulate florets white or pinkish-white, limb 10–15 mm long and 3–5 mm wide; corolla of disk florets 3–5 mm long. Achenes excluding pappus 2.5–4.0 mm long and 0.6–0.8 mm wide, more or less hairy in upper half; pappus 4–7 mm long, often turning more or less brown (up to dark brown). Flowering July to September.

Screes of small stones, gravel beds; rubble slopes from 3,000 to 4,500 m.—*Soviet Central Asia*: Tien Shan, Pamiro-Alai (Zeravshan, Turkestan, Alai, Darvaz, Karateg, and southwestern Pamir ranges). *General distribution*: India (northern part), Afghanistan, China (Tibet). Described from the Himalayan Mountains. Type in Paris.

2. *W. stoliczkae* (Clarke) Ostenf. in Hedin, S. Tibet, VI, 3 (1922) 38.—*W. korolkowii* Rgl. and Schmalh. in Rgl. in Tr. Peterb. Bot. Sada, VI (1879) 310; O. and B. Fedtsch. Perech. Rast. Turk. IV, 214.—*Allardia stoliczkae* Clarke, Compos. Ind. (1876) 145.

Perennial. Plants up to 10–15 cm high, with strongly branched glabrous or subglabrous creeping rhizome. Leaves 4–5 cm long and 1.0(1.5) cm wide, green, glabrous, lacking punctate glandular hairs. Involucre whitish-tomentose only at base, or glabrous. Achenes sparsely hairy mainly in upper part, sometimes completely glabrous. Other characters like previous species. Flowering July to September.

Screes of small stones, gravel beds, rubble slopes from 3,000 to 4,500 m.—*Soviet Central Asia*: Tien Shan (western part, Chatkal, Talass Alatau, and Kirgiz ranges), Pamiro-Alai Region (western part, including western Pamir). *General distribution*: India (northern part), Afghanistan, Tibet. Described from Himalayan Mountains. Type in Calcutta or London.

Note. The specimen of this species from the Karakorum Mountains in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, identified as “*Allardia stoliczkae*” by C.B. Clarke, is identical with the type material of *Waldheimia korolkowii*. P. Wendelbo (*Nytt. Mag. for Bot.*, Vol. I, 1952, p. 65) also points out the total

similarity of these two species. However, it cannot be considered as conclusively proven.

The species is extremely close to the previous one, differing from it only by the almost complete absence of tomentose pubescence. The incomplete overlap of their ranges and the absence of "intermediate" forms, nevertheless, provide a basis for retaining *W. stoliczkae* as a separate species.

3. *W. transalaica* Tzvel. sp. nova in Addenda, XXV, 875.

Perennial. Plants up to 10 cm high, with strongly branched creeping rhizome, grayish from loose but copious tomentum of long and flexuous simple hairs. Stems numerous, more or less caespitose, less often few, covered with thin coriaceous brownish sheaths of strongly reduced lower leaves at base, simple, terminating into single capitulum, usually exceeding upper leaves. Leaves up to 2.5–3.0 cm long and 1.0(1.5) cm wide, sparsely tomentose, lacking punctate-glandular hairs, lamina rather abruptly narrowed in long-winged petiole lacking or with isolated, strongly reduced, lateral lobes; lamina more or less ovate, 2-(rarely 1-) pinnatipartite up to narrow-winged axis, with 2–5 lobes on each side; terminal segments lanceolate to broadly ovate, up to 1 mm wide with rather long cusp. Involucre 1.2–2.0 cm in dia, 4–6 mm long; involucre bracts tomentose adbasally and dorsally. Ligulate florets 6–20, fertile; their corolla white, limb 7–12 mm long and 2–4 mm wide; corolla of disk florets 3.5–5 mm long. Achenes excluding pappus 3–4 mm long, 0.6–0.8 mm wide, densely pilose up to base; pappus 5–7 mm long, usually light gray. Flowering August to September (Plate XI, Fig. 1.)

Gravel beds and screes of small stones at 3,000–4,500 m.—*Soviet Central Asia*: Pamiro-Alai (Trans-Alai Range). Endemic. Described from the Trans-Alai Range. Type (Kirgizian SSR, high foothills of Trans-Alai Range, gravel bed in upper reaches of Kapstur River, 11.VIII.1933, No. 867, I. Tyshchenko) in Leningrad.

Note. Besides a separate range, it differs from *W. tomentosa* in the shape of the leaves as well as by having achenes densely pilose to the very base.

Section 2. Waldheimia.—Ligulate florets sterile, with strongly reduced pappus; achenes glabrous; plants up to 5–6 cm high; capitula on very short peduncles; leaves spatulate, apically 3–5-lobed.

Type of section: type of genus.

4. *W. tridactylites* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 126; Ldb. Fl. Ross. II, 627; O. and B. Fedtsch. Perech. Rast.

Turk. IV, 214, p. p.—*Allardia tridactylites* (Kar. and Kir.) Sch. Bip. in Pollichia, XXXXI (1863) 442; Kryl. Fl. Zap. Sib. XI, 2759.—**lc.**: Jubil. semisaec. G. Fischer de Waldheim (1847) t. 1; Pflanzenfam. IV, 5, 275, fr.

- 270 Plants up to 6 cm high, with strongly branched woody completely glabrous, creeping rhizome. Stems (as also nonflowering shoots) numerous, sparsely or densely caespitose, basally covered with coriaceous-scaly brownish sheaths of strongly reduced lower leaves, terminating into a single capitulum, usually not exceeding upper leaves. Leaves up to 2 cm long and 1 cm wide, spatulate, cuneately narrowed toward base in short winged petiole, 3(5)-lobed or parted at apex; lobes usually oblong, obtuse. Involucre 1.2–2.0 cm in dia, 4–5 mm long, glabrous. Ligulate florets 8–15, sterile, with strongly reduced pappus, their corolla pink or pinkish-white, limb 7–11 mm long and 2.5–4.0 mm wide; corolla of disk florets 4.0–5.5 mm long. Achenes excluding pappus 3–4 mm long and 0.6–0.8 mm wide, glabrous; pappus 6.5–8.0 mm long, usually with reddish or brownish tinge. Flowering July to September.

Screes of small stones, rubble slopes, rock crevices above 3,000 m.—*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan (central and eastern parts), Pamiro-Alai (eastern Pamir, rarely). *General distribution*: Mongolia (western part), Dzhungaria-Kashgaria. Described from Dzhungarian Alatau. Type and isotype in Leningrad.

5. **W. glabra** (Decne.) Rgl. in Tr. Peterb. Bot. Sada VI (1879) 310.—*W. tridactylites* auct. non Kar. and Kir.; O. and B. Fedtsch. Perech. Rast. Turk. IV, (1911) 214 p. p.—*Allardia glabra* Decne. in Jacquem. Voyage Inde, Bot. IV (1844) 88, t. 96.—**lc.**: Decne. l. c.; Blatter, Beaut. Flow. of Kaschmir. I (1927) t. 30; Pampanini Fl. Caracor. t. 6 (sub. *W. tridactylites*).

Perennial. Plants up to 3–4 cm high, with strongly branched, woody, creeping rhizome, more or less tomentose, usually subglabrous. Stems numerous, sparsely or densely caespitose, basally covered with coriaceous-scaly brownish sheaths of strongly reduced lower leaves, terminating into a single capitulum on very short peduncles, more or less sparsely hairy, usually not exceeding upper leaves. Leaves up to 1.5 cm long and 0.8 mm wide, spatulate, cuneately narrowed toward base into short-winged petiole, 3(5)-lobed or parted at apex, with obtuse oblong lobes; upper leaves usually finely arachnoid-tomentose, others glabrous. Involucre 1.0–1.5 cm in dia, 3.0–4.5 mm long, more or less sparsely tomentose at base. Ligulate florets 8–15, sterile, with strongly reduced pappus; their corollas pink of different shades to almost white,

limb 6–10 mm long and 2.5–4 mm wide; corolla of disk florets 3.5–5 mm long. Achenes excluding pappus 2.5–3.5 mm long, 0.5–0.7 mm wide, glabrous; pappus 6.0–7.5 mm long, usually with pinkish-violet or brownish tinge. Flowering July to September.

- 271 Screes of small stones, rubble slopes, rock crevices, above 3,500 m.—*Soviet Central Asia*: Pamiro-Alai. *General distribution*: India (northern part), Afghanistan, China (southwestern regions). Described from the Himalayas. Type in Paris.

Note. Recently, this species has often been combined with the previous species. However, the morphological differences between them, although not significant, along with their isolated ranges, in my view are sufficient to retain *W. glabra* as a separate species—ecogeographical race (which, in particular, was also noted by Regel, loc. cit.). Still a third Tibetan ecogeographical race of this series can be found: *W. huegelii* (Sch. Bip.) Tzvel. comb. nova (= *Allardia huegelii* Sch. Bip. op. cit. 442 and *Waldheimia stracheyana* Rgl. op. cit. 309), which is characterized by a more dense arachnoid-tomentose pubescence over the whole plant.

GENUS 1531. *Ugamia* Pavl.^{1,2}

Pavl. in Vestn. Akad. Nauk KazSSR, VIII (1950) 25.

Capitula solitary (but numerous on a single plant), on very short (up to 6 mm long), arcuate peduncle, homogamous, with numerous, bisexual, tubular disk florets. Involucre cupuliform, 7–12 mm in dia and 7–10 mm long; involucre bracts coriaceous-herbaceous, imbricate, in 4–5 irregular rows, outer deltoid lanceolate, inner 2–3 times as long, oblong-linear; all bracts with more or less wide, brownish or dark brown membranous border. Receptacle weakly convex, almost flat, solid, lacking scales, sparsely punctate-tuberculate. Corolla of tubular disk florets pale yellow, more or less brown in upper part, 4.0–5.5 mm long, much longer than wide, with tube slightly and gradually broadening in upper half, with 5 lanceolate-deltoid, weakly deflexed teeth, a sixth to a fifth as long as tube. Filaments thickened in upper part; anthers lacking distinct basal appendage but with ovoid-lanceolate subacute apical appendage; pollen grains spherical, spiny. Styles bifid, their branches linear, truncate. All achenes similar, 4.0–5.5 mm long, 0.8–1.0 mm wide, with 10–15 longitudinal veins of which 5 usually

¹Treatment by N.N. Tzvelev.

²Named after the Ugam Range (western Tien Shan), where the only species of the genus is found.

more prominent, densely covered with semi erect hairs throughout, prismatic-cylindrical, narrowed toward base; pappus 5–7 mm long, as pappose corona, divided up to base in 10–20 narrow-linear scales, finely and irregularly toothed on margin. Dwarf semi-shrubs rather
 272 densely covered with simple hairs, strongly woody and branched at base, with numerous, prostrate or ascending flowering and nonflowering shoots, densely caespitose; leaves small (up to 1.2 cm long), alternate, with pinnately cut lamina.

A monotypic genus.

Note. The only species of the genus shows a distinct affinity with species of *Trichanthemis* Rgl. and Schmalh. and could even be combined with it as a separate subgenus or section. However, the highly distinctive appearance (particularly the strongly reduced and arcuate peduncles of the capitula, which are not to be found in other more or less closely related genera), cupuliform involucre, almost flat receptacle, much longer than wide corolla of the tubular florets, and structure of the pappus of the achene, quite similar to the tuft-like pappus typical of *Waldheimia* Kar. and Kir. all provide a basis, following N.V. Pavlov, to consider this remarkable narrow endemic species as a separate monotypic genus.

1. ***U. angrenica*** (Krasch.) Tzvel. comb. nova; Pavl. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 371, in syn. (sphalm.).—*U. trichanthemoides* Pavl. in Vestn. Akad. Nauk Kazakhsk. SSR, VIII (1950) 26.—*Cancrinia angrenica* Krasch. in Fedde, Repert. XXVI (1929) 29; Polyak. op. cit. 371.—**lc.**: Pavl. op. cit. 26, fig. 18.

Perennial. Dwarf semishrubs, 2–8 cm high, with thick, woody, many-headed root, usually covered with short and long, simple hairs. Stems (flowering shoots) numerous, with nonflowering shoots, more or less densely caespitose, strongly woody and branched at base, prostrate or ascending. Leaves dull-green or almost grayish-green from rather dense pubescence, lacking punctate glandular hairs, numerous; all leaves more or less similar, up to 1.2 cm long and 0.6 mm wide, on short petiole strongly thickened at base; lamina oblong or oblong-linear, pinnately cut up to almost wingless axis; leaf segments 4–10 on each side, all or some 2–5 parted; terminal lobes linear- or lanceolate-filiform, somewhat thick, up to 0.5–0.6 mm wide, with cartilaginous cusp; upper cauline leaves sessile. Capitula solitary (but numerous on a single plant), on very short (up to 6 mm long), arcuate peduncle at apices of flowering shoots. Involucre 7–12 mm in dia, 7–10 mm long; sparsely hairy; involucre bracts with brownish or dark brown membranous border, broader and appendiculately broadening at apex of inner bracts. Corolla of tubular florets 4.0–5.5 mm long. Achenes

4.0–5.5 mm long, with 10–15 longitudinal ribs, of which 5 usually more
 273 prominent, densely pubescent; corona pappose, 5–7 mm long, cut up to
 base into 10–20 narrow-linear scales. Flowering July to August.

Rubbly and stony slopes, gravel beds above 2,000 m.—*Soviet
 Central Asia*: Tien Shan (Chatkal, Pskem, Ugam ranges). Endemic.
 Described from the Chatkal Range. Type and isotypes in Leningrad.

GENUS 1532. *Trichanthemis* Rgl. and Schmalh.^{1,2}

Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 617.—
Glossanthis Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR,
 XIX (1959) 369.

Capitula always solitary (but numerous on a single plant), on long
 erect peduncle, homogamous, with numerous bisexual tubular disk
 florets, or heterogamous, with many (4–22), pistillate, ligulate, outer
 florets in one row, and numerous bisexual, tubular disk florets. Involucre
 patelliform or broadly cupuliform, 7–22 mm in dia and 4–8 mm long;
 involucre bracts coriaceous-herbaceous, imbricate, in 3–5 irregular
 rows, outer lanceolate or lanceolate-ovate, inner linear-oblong or linear;
 all bracts with more or less distinct dark or brownish membranous
 border. Receptacle weakly or strongly convex, solid, more or less hairy
 or glabrous, punctate-tuberculate. Capitula of ligulate florets yellow,
 white, or pinkish-white, with flattened tube 1.8–3.0 mm long lacking
 spur and with oblong-oval or linear-oblong 6–22 mm long limb; corolla
 of tubular disk florets yellow, 2.4–5 mm long, with rather long tube,
 usually slightly and gradually broadened in upper half, with 5 lanceolate-
 deltoid or deltoid, weakly deflexed teeth, a fifth to a fourth as long as
 tube. Filaments thickened in upper part; anthers lacking distinct basal
 appendage, but with lanceolate-ovoid subobtusate terminal appendage;
 pollen grains roundish, spiny. Style bifid; their branches linear, truncate.
 All achenes similar, completely covered with more or less adpressed
 directed upward hairs, 1.5–3.6 mm long and 0.6–1 mm wide, with 5–
 8 prominent longitudinal ribs; pappus 0.8–6 mm long, as corona, cut
 up to base into (4)5–10(12) linear oblong or ovate scales. Plants more
 or less covered with long and short simple hairs, usually strongly woody
 at base, less often (section *Subbulbosa*) herbaceous perennials with
 274 short nonflowering shoots, sparsely leafy erect stems and alternate
 leaves with pinnatisect lamina.

¹Treatment by N.N. Tzvelev.

²From the Greek words: *thrix* (*trichos*)—hair; and *anthemos*—floret, so named
 because of hairy corolla and achenes of many species of this genus.

Endemic genus of the USSR with 7 species distributed in the mountains of Soviet Central Asia.

Type of genus: *Trichanthesis karataviensis* Rgl. and Schmalh.

Note. The species of this genus are quite distinct and differ from each other by a whole series of rather important characters that they can, with full justification, be divided into five sections, three of which are monotypic. Nevertheless, on the whole, there are no doubts about their close affinity and the naturalness of the entire genus. Convenient but entirely unjustified with regard to a natural classification is the splitting off of all species with ligulate florets into a separate section (*Ligulata* Krasch.) or even as a separate genus (*Glossanthis* Poljak.). A detailed study of the entire set of morphological characters convincingly shows, for example, that the species *T. aurea* is closest to *T. paradoxus*, and *T. radiata*, despite its distinctive position, is closer to *T. karataviensis* than to other species with ligulate florets.

On the whole, the genus is quite close to the genera *Pyrethrum* Zinn and *Cancrinia* Kar. and Kir. As already mentioned (cf. note to section *Trichanthemopsis* Tzvel. of *Pyrethrum*), even *Pyrethrum tianschanicum* Krasch., which differs from *Trichanthesis butkovii* only by having glabrous achenes and fewer rows of involucre bracts, perhaps even deserves to be included in the genus *Trichanthesis*. However, this species is no less closely related also to other groups of the genus *Pyrethrum*. The species *T. litwinowii* and *P. paradoxus* earlier were included in *Cancrinia*; however, careful comparison of them with the other species of *Trichanthesis* and with the species of *Cancrinia* easily convinces me of their much closer relationship to such species as *Trichanthesis aurea* and *T. karataviensis* than to *Cancrinia chrysocephala* Kar. and Kir., not to mention other species of this genus.

- | | | | |
|-----|----|--|----|
| | 1. | Corolla of tubular disk florets profusely hairy | 2. |
| | + | Corolla of tubular disk florets glabrous | 4. |
| | 2. | Capitula lacking ligulate florets (section <i>Trichanthesis</i>) | |
| | | 2. T. karataviensis Rgl. and Schmalh. | |
| | + | Capitula with ligulate florets | 3. |
| | 3. | Ligulate florets pinkish-white (section <i>Ligulata</i>) | |
| | | 1. T. aulieatensis (B. Fedtsch.) Krasch. | |
| | + | Ligulate florets yellow (section <i>Subbulbosa</i>) | |
| | | 3. T. radiata Krasch. and Vved. | |
| 277 | 4. | Corona of achenes divided in (8)10(12) narrow-linear scales; involucre bracts with narrow membranous border (section <i>Leianthus</i>) | 5. |
| | + | Corona of achenes divided in (4)5-6(8) oblong scales; involucre bracts (especially inner) with strongly broadened membranous border (section <i>Pyrethroides</i>) | 6. |

5. Ligulate florets yellow, 4–10 4. **T. aurea** Krasch.
 + Ligulate florets absent 5. **T. paradoxos** (Winkl.) Tzvel.
 6. Ligulate florets white, numerous 6. **T. butkovii** Koval.
 + Ligulate florets absent 7. **T. litwinowii** (Krasch.) Tzvel.

Section 1. Ligulata Krasch. in Fedde, Repert. XXVI (1929) 28 p. p.; Lipschitz in Byull. Mosk. Obshch. Isp. Prir., Otd. Biol. XLV (1936) 57 p. p.—*Glossanthis* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 369 p. p. non *Glossanthus* Klein ex Benth., 1835.—Plants 20–40 cm high, strongly woody at base. Involucre 14–23 mm in dia; outer bracts 2/5–2/3 as long as innermost. Receptacle strongly convex, profusely hairy; ligulate florets numerous, pinkish-white, with linear-oblong corolla limb 12–22 mm long; corolla of tubular disk florets profusely hairy. Achenes 2.4–3.2 mm long; corona 4–6 mm long, divided in (8)10(12) narrow-linear scales.

A monotypic section.

1. **T. aulieatensis** (B. Fedtsch.) Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, I (1933) 184.—*Chrysanthemum aulieatense* B. Fedtsch. in Knorr. and Minkv. Tr. Pochv.-Bot. E'ksp. Peresel. Upr. VI (1912) 187.—*Glossanthis aulieatensis* (B. Fedtsch.) Poljak. in Bot. Met. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 369.—**lc.**: B. Fedtsch. 1. c. t. 31.

Perennial. Plants 20–40 cm high, with thick woody root, more or less covered with scattered, long, simple hairs, usually subglabrous. Stems rather numerous, strongly woody at base, usually branched below, sparsely leafy, erect or ascending at base. Leaves glabrous or subglabrous lacking punctate-glandular hairs; basal leaves up to 10 cm long and 2 cm wide, on long (sometimes exceeding lamina) petiole, strongly thickened at base; their lamina oblong, once or twice pinnately cut, with 3–5 segments on each side; terminal segments linear-filiform, somewhat thick, up to 0.8 mm wide, with rather long cusp, few cauline leaves reduced and less divided, sessile. Capitula solitary (but numerous on a single plant), on long (up to 20 cm), more or less hairy peduncle. Involucre 14–23 mm in dia, 6–8 mm long, rather densely hairy near base; involucre bracts coriaceous-herbaceous, outer broadly lanceolate, subacute, inner oblong-linear, 1.5–2.5 times as long; all bracts with rather wide, dark brown or brownish membranous border, appendiculately broadened at apex in inner bracts. Receptacle strongly convex, densely pubescent. Ligulate florets 10–18, pinkish-white, with corolla tube 1.8–2.0 mm long and limb 12–22 mm long; corolla of tubular florets densely hairy, 3–5 mm long. Achenes 2.4–3.2 mm long, with (4)5–6(7) long ribs, densely hairy; corona 4–6 mm long, divided



up to base into (8)10(12) narrow-linear, subacute scales. Flowering May to June. (Plate XXVII, Fig. 1.)

Stony slopes, rocks in middle mountain zone.—*Soviet Central Asia*: Tien Shan (Ichkele-Tau Mountains). Endemic. Described from Ichkele-Tau Mountains (western Tien Shan). Type and isotypes in Leningrad.

Section 2. *Trichanthemis*.—*T. sect. Eutrichanthemis* Lipsch. in Byull. Mosk. Obshch. Isp. Prir., Otd. Biol., XLV (1936) 57.—Plants strongly woody at base, 5–20 cm high. Involucre 7–12 mm in dia; outer bracts 1/2–2/3 as long as innermost. Receptacle rather strongly convex, densely hairy; ligulate florets absent; corolla of tubular florets densely hairy. Achenes 2.0–3.2 mm long; corona 0.8–2.0 mm long, divided into (4)5–8(10) broadly ovate to oblong-linear scales, sometimes more or less truncate.

Type of section: type of genus.

2. ***T. karataviensis*** Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 617; O. and B. Fedtsch. Perech. Rast. Turk. IV, 180.—*Cancrinia lasiantha* Winkl. in Tr. Peterb. Bot. Sada, XIII (1894) 235; O. and B. Fedtsch. op. cit. 178.—*C. karataviensis* (Rgl. and Schmalh.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 372.—**lc.**: Pavlov in "Sovetsk. Kauchuk.", III (1922) 25; Korovin, Rast. Sredn. Azii (1934) 421.—**Exs.**: Herb. Asiae Med, No. 194; Pavlov, Pl. turkest. edit. No. 90.

Perennial. Plants 5–20 cm high, with thick, woody, many-branched root, dull-green or grayish-green from rather dense pubescence of long, flexuous, simple hairs. Stems rather numerous, strongly woody and more or less branched at base, simple above, very sparsely leafy, erect or ascending at base. Leaves dull-green or even grayish-green from rather dense pubescence, less often subglabrous with inconspicuous punctate-glandular hairs; basal leaves numerous, very fragile when dry, 2.5(3) cm long and 0.8(1.0) cm wide, on quite long (but shorter than lamina) petioles, strongly thickened at base; their laminae broadly linear or linear-oblong, pinnatisect, with segments appressed or semiappressed to main leaf axis, 2–3-parted up to or almost to base into linear-filiform somewhat thick, up to 0.6 mm wide lobes; few cauline leaves like basal, but sessile or subsessile. Capitula solitary (but numerous on a single plant), on long, densely hairy peduncle. Involucre 7–12 mm in dia, 4–5 mm long, more or less hairy; involucre bracts coriaceous-herbaceous, outer lanceolate, subacute, usually lacking border, inner linear-oblong, 1.5–2 times as long, with rather wide, light-colored, membranous border. Receptacle rather strongly convex, densely pubescent; corolla of tubular florets 2.4–3.0 mm long. Achenes 2–3

mm long and about 0.7–0.8 mm wide, densely hairy, with (4)5(8) long ribs; corona 0.8–2.0 mm long, divided in (4)5–8(10) broadly ovate to oblong-linear scales, sometimes more or less truncate (scales shorter on dorsal side). Flowering May to July. (Plate XII, Fig. 1.)

Rubby and stony, sometimes clayey slopes up to middle mountain zone.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (southern foothills of Dzhungarian Alatau), Lake Balkhash Region (Chu-Ili Mountains), Tien Shan (Karatau Mountains and adjoining regions), Pamiro-Alai Region (foothills of Zeravshan Range). Endemic. Described from the Karatau Mountains. Type and isotype in Leningrad.

Note. A polymorphic species, strongly varying in pubescence, size of capitula, length of corona on achenes, etc., and, apparently, separating into several ecogeographical races. However, we could not find stable differences between the type specimens from the Karatau Mountains and specimens from geographically completely isolated parts of its range in the foothills of Zeravshan Range, from where *Cancrinia lasiantha* Winkl. is described, and the foothills of Dzhungarian Alatau, from where *T. karataviensis* ssp. *dshungarica* Rubtz. is described [in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, VIII, 5 (1940) 65]. On the average, the latter subspecies in fact has larger capitula with a wider membranous border on the involucre bracts, but similar specimens are also found in the Karatau Mountains.

Economic Importance. According to Pavlov (op. cit.) its leaves contain traces of rubber.

Section 3. Subbulbosa Tzvel. sect. nova. in Addenda XXV, 877.—Herbaceous plants 10–35 cm high, with strongly thickened (almost bulbous) bases of branches. Involucre 12–20 mm in dia; outer bracts a half to two-thirds as long as inner. Receptacle strongly convex, densely hairy; ligulate florets numerous, yellow, with oblong-oval, corolla limb 8–12 mm long; corolla of tubular florets densely hairy. Achenes 2.8–3.6 mm long; corona 3.0–4.2 mm long, strongly truncate (often almost to base on dorsal side), divided in (4)5–8(10) broadly ovate to oblong-linear scales.

A monotypic section.

- 280 3. **T. radiata** Krasch. and Vved. in Fedde, Repert. (1929) 29.—*Glossanthus radiatus* (Krasch. and Vved.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 370.

Perennial. Plants 10–35 cm high, with thick, many-branched tap root more or less bulbous at base of branches, usually covered with long, flexuous, simple hairs and floccose tomentum of such hairs. Stems usually rather numerous, erect or ascending at base, sparsely leafy,

simple. Leaves usually dull-green or even grayish-green from isolated hairs and floccose tomentum usually on their petioles and rachis, often completely absent, lacking punctate-glandular hairs; basal leaves up to 8 cm long 3–4 cm wide, on rather long (but shorter than lamina) petiole, strongly broadening at base and with dense tomentum in their axils; their laminae oblong to oblong-linear, pinnately cut; leaf segments 3–10 on each side, divided at or near base into rather numerous, narrow-linear (up to 0.8 mm wide), somewhat thick lobes, usually in a different plane than leaf axis (closer to a whorl); few cauline leaves like basal, but smaller, upper sessile. Capitula solitary, on rather long (up to 15 cm), more or less tomentose peduncles. Involucre 12–20 mm in dia, 6–7.5 mm long, sparsely tomentose at base; involucre bracts almost herbaceous, outer broadly lanceolate, acuminate, with very narrow membranous border, inner 1.8–2 times as long, oblong-linear, with wider, apically broadened, light colored or brownish, membranous border. Receptacle strongly bulged, densely pubescent. Ligulate florets 12–25, yellow, with corolla tube 2–3 mm long and limb 8–12 mm long; corolla of tubular florets 3.5–4.5 mm long, densely pubescent. Achenes 2.8–3.6 mm long, densely pubescent, with 5–8 longitudinal ribs; corona 3.0–4.2 mm long, strongly truncate, divided in (4)5–8(10) broadly ovate to oblong-linear scales. Flowering June to July. (Plate XI, Fig. 2.)

Rubbly and stony slopes, rocks at 1,500 to 2,500 m.—*Soviet Central Asia*: Tien Shan (Karatau Range, Talass Alatau, Kuyuk). Endemic. Described from the Kuyuk Mountains (western Tien-Shan). Type or isotype(?) in Leningrad.

Section 4. *Leianthus* (Novopokr. and Sidor.) Tzvel. comb. nova.—*T. sect. Eutrichanthemis* subsect. *Leianthus* Novopokr. and Sidor. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIII (1950) 349.—Plants 5–25 cm high, strongly woody at base. Involucre 7–12 mm in dia; outer bracts a third to a half as long as innermost. Receptacle rather strongly or weakly convex, densely or sparsely hairy (to subglabrous). Ligulate florets 4–10, yellow, with oblong-oval corolla limb 6–12 mm long, or entirely absent. Corolla of tubular florets glabrous. Achenes 1.5–2.4 mm long; corona 1.3–3.4 mm long, divided into (8)10(12) narrow-linear scales.

Type of section: *Trichanthemis paradoxos* (Winkl.) Tzvel.

4. ***T. aurea*** Krasch. in Fedde, Repert. XXVI (1929) 28–29.—*T. radiata* auct. non Krasch. and Vved.: Lipsch. in Byull. Mosk. Obshch. Isp. Prir. Otd. Biol. XLV (1936) 59 p. p.—*Glossanthis aurea* (Krasch.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 370.

Perennial. Plants 5–15 cm high, with thick, woody many-branched root, dull-green or grayish-green from rather dense pubescence of long, flexuous, simple hairs. Stems rather numerous, strongly woody and more or less branched at base, simple above, very sparsely leafy, erect or ascending at base. Leaves dull-green or almost grayish-green from rather dense pubescence, lacking punctate-glandular hairs; basal leaves up to 2 cm long and 0.5 cm wide, on rather long (but shorter than lamina) petiole, strongly thickened at base, tomentose in axil; lamina of basal leaves broadly linear to linear-oblong, pinnately cut; leaf segments quite distant, 3–5 on each side, 2–5-pinnately or palmately parted into narrow-linear and lanceolate, subacute lobes up to 0.5 mm wide, usually in a different plane than rachis; few cauline leaves strongly reduced, uppermost sessile. Capitula solitary, on rather long (up to 10 cm), finely tomentose peduncle. Involucre 7–12 mm in dia and 5–7 mm long, densely pubescent near base; involucre bracts coriaceous-herbaceous, outer ovate, obtuse, inner 2–3 times as long, linear-oblong; all bracts with rather wide, light colored, membranous border on margin. Receptacle strongly convex, densely pubescent. Ligulate florets 4–10, yellow, with corolla tube about 1.8 mm long and limb 6–12 mm long; corolla of tubular florets 2.5–3.2 mm long, glabrous. Achenes 2.0–2.4 mm long, about 0.6–0.7 mm wide, more sparsely hairy, with 5–8 longitudinal ribs; corona 2.5–3.4 mm long, divided in (8)10(12) narrow-linear scales. Flowering May to June.

Stony (predominantly shaly) slopes of lower mountain zone.—*Central Asia*: Syr-Darya (northern foothills of Alai Range). Endemic. Described from northern foothills of Alai Range. Type in Leningrad.

5. **T. paradoxos** (Winkl.) Tzvel. comb. nova.—*T. glabriflora* Novopokr. and Sidor. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIII (1950) 347.—*Cancrinia paradoxos* Winkl. in Tr. Peterb. Bot. Sada, XI, 12 (1891) 371; O. and B. Fedtsch. Perech. Rast. Turk. IV, 178.—*C. paradoxa* Winkl. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 371.—*Ic.*: Novopokr. and Sidor. op. cit. 348.

282 Perennial. Plants 6–25 cm high, with thick, woody, many-branched root, usually covered with long simple hairs. Stems rather numerous, strongly woody and more or less branched at base, simple above, very sparsely leafy, erect or ascending at base. Leaves dull green from more or less dense pubescence, lacking punctate-glandular hairs; basal leaves numerous, 2.0–2.5 cm long, and 0.6 cm wide, on rather long (but shorter than lamina) petiole, strongly thickened at base (but not tomentose in axil) and persisting long after withering of leaves; their laminae linear-oblong or oblong, pinnately cut; leaf segments pinnately

or palmately 2–5 parted into narrow-linear and oblong somewhat thick up to 0.8 mm wide lobes, usually in a different plane than rachis; few cauline leaves strongly reduced, short-petiolate. Capitula solitary, on rather long peduncle. Involucre 8–12 mm in dia, 5–6.5 mm long, glabrous or subglabrous; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, subacute, with very narrow border, inner 2–3 times as long, oblong-linear, with rather wide light colored or brownish, membranous border, appendiculately broadened at apex. Receptacle weakly convex, sparsely pubescent to subglabrous. Ligulate florets absent; corolla of tubular florets 2.4–3 mm long, glabrous. Achenes 1.5–2.2 mm long, about 0.6–0.7 mm wide, rather densely pubescent, with 5 (rarely to 8) longitudinal ribs, corona 1.3–2.2 mm long, divided into (8)10(12) narrow-linear scales. Flowering July to August.

Rubby and stony slopes, steppes up to 2,000 m—*Soviet Central Asia*: Tien Shan (central part and Kuramin Range). Endemic. Described from Central Tien Shan. Type in Leningrad.

Note. Despite the geographic isolation, the plants of *T. glabriflora* Novopokr. and Sidor. from the Kuramin Range are identical with the typical specimens of *T. paradoxos* from the central Tien Shan.

Section 5. Pyrethroides Tzvel. op. cit. 877.—Plants strongly woody at base, 15–40 cm high. Involucre 9–12 mm in dia; outer bracts 1/3–1/2 as long as innermost. Receptacle weakly convex, glabrous or subglabrous; ligulate florets numerous, white, with corolla limb oblong-ovate, 8–12 mm long or entirely absent; corolla of tubular florets glabrous. Achenes 2–3 mm long; corona 1.5–2.0 mm long, divided into (4)5–6(8) oblong scales.

Type of section: *Trichanthemis litwinowii* (Krasch.) Tzvel.

6. **T. butkovii** Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 32.—**lc.**: Koval. op. cit. p. 33.

Perennial. Plants 20–40 cm high, with thick, woody many-branched root, usually covered with long, flexuous, simple hairs, often subglabrous. Stems rather numerous, strongly woody, and more or less branched at base, simple above, sparsely leafy, erect or ascending at base. Leaves glabrous or sparsely hairy; basal leaves up to 6 cm long and 2 cm wide, on short petioles strongly thickened at base; their lamina oblong-obovate, twice or thrice pinnately cut, with more distant segments; terminal segments narrow-linear, somewhat thick, terminating into short cusp; cauline leaves reduced and less divided, except lowermost-sessile. Capitula solitary, 3.0–3.5 cm in dia, on long peduncle more or less hairy in upper part. Involucre bracts sparsely hairy or subglabrous; outer bracts lanceolate-ovate, with rather narrow

membranous border, inner 2–3 times as long, linear-oblong, with very wide, light colored membranous border, appendiculately broadened at apex. Receptacle weakly convex, glabrous. Ligulate florets white, corolla limb oblong-oval; corolla of tubular florets glabrous. Achenes 2.0–2.5 mm long, with (4)5(8) longitudinal ribs, rather densely hairy; corona about 1.7 mm long, divided into oblong scales. Flowering June to July.

Rocks of middle and upper mountain zones.—*Soviet Central Asia*: Tien Shan (Chatkal River basin). Endemic. Described from western Tien Shan (Ak-Bulak River in Chatkal River basin). Type in Tashkent.

Note. This species diagnosis was kindly provided by S.S. Kovalevskaya prior to its publication. *T. butkovii* shows a quite clear relationship with both *Trichanthemis litwinowii* and *Pyrethrum tianschanicum*, as though occupying with these species an intermediate position between the genera *Pyrethrum* and *Trichanthemis*.

7. ***T. litwinowii*** (Krasch.) Tzvel. comb. nova.—*Cancrinia litwinowii* Krasch. in Bot. Mat. Gerb. Glavn. Bot. Sada, III (1922) 81; Poljakov in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 372.—*Pyrethrum simulans* Pavl. in Vestn. Akad. Nauk Kazakhsk. SSR, 3 (1950) 36.—**Ic.:** Pavl. *ibid.* 37, fig. 12.

284 Perennial. Plants 15–30 cm high, with thick, woody, many-branched root, usually covered with long simple hairs. Stems rather numerous, strongly woody and more or less branched at base, simple above, sparsely leafy, erect or ascending at base. Leaves sparsely hairy or subglabrous, lacking punctate-glandular hairs; basal leaves usually up to 2.5 cm long, 0.6 cm wide, less often up to 5 cm long and 1.5 cm wide, on very short petioles strongly thickened at base; their lamina broadly linear or linear-oblong, palmately cut up to almost wingless axis; leaf segments 5–10 on each side, strongly reduced toward base of lamina, 2–5-parted or partly entire; terminal lobes linear- or lanceolate-filiform, somewhat thick, up to 0.6 mm wide, with short cartilaginous cusp; cauline leaves smaller and less divided, upper sessile. Capitula solitary, on long, sparsely pubescent peduncle. Involucre 9–12 mm in dia, 6–8 cm long, with more or less pubescent near base; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, subobtusate, inner 2–3 times as long, oblong-linear and oblong; all bracts with very wide, light colored (silvery), membranous border at apex, appendiculately broadened at apex of inner bracts. Receptacle weakly convex, glabrous or subglabrous (with isolated fragile hairs). Ligulate florets absent; corolla of tubular florets 3–4 mm long, glabrous. Achenes 2–3 mm long, about 0.6–0.7 mm wide, with 5–8 longitudinal ribs, quite densely (not very densely) hairy; corona 1.5–2.0 mm long, divided

in (4)5–6(8) oblong, more or less irregularly toothed scales. Flowering July to August.

Rocks, stony slopes, mainly in middle mountain zone.—*Soviet Central Asia*: Tien Shan (Chatkal and Pskem ranges). Endemic. Described from the Chatkal Range. Type and isotype in Leningrad.

Note. The isotype of *Pyrethrum simulans* Pavl. in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR, described from the Pskem Range, differs from the typical specimens of *T. litwinowii* from the Chatkal Range by having larger (up to 5 cm long) leaves and more densely hairy achenes. Nevertheless, it probably constitutes a separate ecogeographical race.

GENUS 1533. *Xylanthemum* Tzvel. Gen. Nov.^{1,2}

Tzvel. in Addenda, XXV, 877.

Capitula solitary or numerous, on rather long (up to 15 cm) peduncle, one each at apices of leafy branches, sometimes at same height as though forming lax corymb, homogamous, with rather numerous (15–50), bisexual, tubular disk florets. Involucre cupuliform or narrow-cupuliform (poculiform), 4–8 mm in dia and 4.5–8.0 mm long; involucre bracts coriaceous-herbaceous, imbricate, in 4–5 irregular rows, outer ovate or broad-lanceolate, subobtusate, with very narrow membranous border, inner broadly linear, 2.5–4 times as long, obtuse, with more or less wide membranous border. Receptacle flat or almost flat, glabrous, solid, punctate-tuberculate. Corolla of tubular disk florets yellow, 2.6–3.2 mm long, with very narrow, long, tube slightly and gradually broadened in upper 2/3, with 5 deltoid teeth, almost not deflected, a seventh to a fifth as long as tube. Filaments
 285 thickened in upper part; anthers lacking distinct basal appendages, but with lanceolate-ovoid obtuse apical appendages; pollen grains roundish, spiny. Styles bifid; their branches linear, truncate. All achenes similar, glabrous, 1.5–3.5 mm long and about 0.6–0.7 mm wide, prismatic, gradually narrowed toward base, with 5, less often 6, prominent longitudinal ribs; pappus as corona, 1.2–2.2 mm long, entire, but incised dorsally to or almost to base, unilateral or divided up to base in 3–6 oblong scales, more or less shifted ventrally. More or less hairy semishrubs (hairs bifid, mixed with simple) with thick woody root,

¹Treatment by N.N. Tzvelev.

²From the Greek words: *xylon*—wood, and *anthemos*—flower; named for the stem which is woody over a large part in the species of this genus.

strongly branched, stems woody long way at the base, and alternate leaves with pinnately cut lamina.

The 5 species of this genus are distributed in Afghanistan, northeastern Iran, and the southern part of Soviet Central Asia. Three of these are found in the USSR.

Type of genus: *Xylanthemum fischeriae* (Aitch. and Hemsl.) Tzvel.

Note. The species of this genus, being closely related ecogeographical races of a single series, constitute a completely separate group, well distinguished by their habit from the other genera of the tribe *Anthemideae*. Poljakov (in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, XIX, 1959, 371) includes the genus in *Cancrinia* Kar. and Kir. emend. Poljak., based on the homogamous capitula borne singly at the apices of leafy branches, without regard to a whole series of other equally important characters. In our circumscription the genus *Xylanthemum* differs from *Cancrinia* Kar. and Kir. in particular by the structure of the pappus, shape of the corolla, cupuliform multiseriate involucre with very small outer bracts, flat receptacle, and stems that are strongly lignified in the lower part. The genus *Trichanthemis* Rgl. and Schmalh. is closer to it, but *Xylanthemum* is distinguished even from this genus quite clearly by the glabrous achenes, structure of the pappus, shape of the corolla, cupuliform involucre, and flat receptacle, not to mention the differences in habit. *Xylanthemum* differs from the other, possibly no less closely related genus *Spathypappus* Tzvel. by the form and structure of the involucre and the absence of ligulate florets.

1. Achenes with corona of 3–6 oblong scales, somewhat approximate and larger on ventral side of achene 1. **X. pamiricum** (Hoffm.) Tzvel.
- + Achenes with entire corona, incised dorsally up to base, unilateral 2.
2. Involucre cupuliform, 5–8 mm in dia and 5–7 mm long; peduncles of capitula 12–15 cm long 2. **X. fischeriae** (Aitch. and Hemsl.) Tzvel.
- 286 + Involucre narrow-cupuliform, 4–5 mm in dia and 4.5–5.5 mm long; peduncles of capitula 3–4 cm long 3. **X. rupestre** (M. Pop. ex Nevski) Tzvel.

1. **X. pamiricum** (Hoffm.) Tzvel. comb. nova.—*Chrysanthemum pamircum* Hoffm. in Pauls, Pl. coll. in As. med. and Pers. (1903) 149.—*Tanacetum kuschakewiezii* O. Fedtsch. Fl. Pamira (1903) 121.—*T. pamiricum* (Hoffm.) Bornm. in Mitteil. Thüring. Bot. Ver. XXII (1907) 48; O. and B. Fedtsch. Perech. Rast. Turk. IV, 205.—*Cancrinia pamirica* (Hoffm.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk

SSSR, XIX (1959) 371.—**lc.**: B. Fedtsch. in Bull. Herb. Boiss. ser. 2, V (1905) t. IV; Pauls. Stud. Veg. Pamir. (1920) 47.

Perennial. Semishrubs, 5–20 cm high, with thick woody root, usually lacking short nonflowering shoots, dull-green or grayish from rather dense appressed, bifid (transitional to simple) hairs. Stem, strongly branched near base, woody over long distance, uniformly leafy, erect or ascending. Leaves more or less appressed hairy to subglabrous, with punctate-glandular hairs; cauline leaves up to 2 cm long and 0.8 cm wide, on rather long petiole, distinctly thickened at base, often with solitary narrow-linear lobes as auricles; their laminae obovate or broadly oval, cuneately narrowed toward base, usually with short lateral lobes extending over petiole, pinnately cut up to narrow-winged axis, with 2–6 approximate lateral segments, in turn almost palmately 2–5 parted; terminal lobes broadly lanceolate to linear, somewhat thick, subacute, more or less revolute, to 1.0–1.5 mm wide; uppermost leaves reduced, sessile, less divided (to entire). Capitula usually numerous on a single plant, one each at apices of leafy branches, on long (up to 6 cm) erect peduncles, often at equal height as though in corymbs. Involucre 5–8 mm in dia and 5–7 mm long, more or less appressed hairy; involucre bracts with narrower brownish, membranous border or almost lacking it; outer bracts a third to two-fifths as long as inner. Corolla of tubular florets yellow, usually somewhat hairy at apex, 2.6–3.2 mm long. Achenes 2.4–3.6 mm long (excluding corona) and about 0.7 mm wide; corona 1.2–1.8 mm long, divided to base into 3–6 oblong scales, more or less ventrally shifted. Flowering July to September.

Stony and rubbly slopes, gravel-beds; above 3,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (Pamir). *General distribution*: Iran-Afghanistan (Afghanistan, northern part). Described from Pamir. Type in Copenhagen; isotype in Leningrad.

Note. The report of this species from Iran relates to *Pyrethrum kermanense* Bornm. (in *Oesterr. Bot. Zeitschr.* XLVII, 1897, p. 291, 287 nom. nudum), subsequently accepted by the author as a synonym of *X. pamiricum*, but apparently constituting a separate ecogeographical race.

2. **X. fischeriae** (Aitch. and Hemsl.) Tzvel. comb. nova.—*Tanacetum fischeriae* Aitch. and Hemsl. in Journ. Linn. Soc. XIX (1882) 170.—*Pyrethrum fischeriae* (Aitch. and Hemsl.) Buser in Boiss. Fl. or. Suppl. (1888) 300.—*Chrysanthemum fischeriae* (Aitch. and Hemsl.) Rech. f. in Kōie and Rech. f. Symb. afghan. II (1955) 45.

Perennial. Semishrubs, 10–25 cm high, with thick woody root, dull green from appressed bifid hairs. Stem like previous species. Leaves like previous species, but usually less hairy, usually with entire lobes. Capitula usually numerous, one each at apices of leafy branches, on

long (3–15 cm long) erect peduncles. Involucre 5–8 mm in dia and 5–7 mm long, more or less hairy; involucre bracts usually with wider, dark brown, membranous border, outer a fourth to a third as long as inner. Corolla of tubular florets yellow, 2.5–3.2 mm long. Achenes 2.4–3.2 mm long, about 0.6–0.7 mm wide; corona 1.5–2.2 mm long, entire, unilateral, sinuate-toothed at apex. Flowering August to September.

Stony and rubbly slopes, gravel beds; above 3,000 m.—*Soviet Central Asia*: Pamiro-Alai (south western Pamir). *General distribution*: Afghanistan. Described from Afghanistan. Type in London; isotype in Leningrad.

Note. Apparently it replaces the previous species in Afghanistan. In the USSR, so far it is known only from one locality (Khorog-Osh highway, near the village ["Kishlak"] of Morch, right bank of the Tobuz-Bulak River, about 3,200 m above sea, 4.IX.1955, No. 5127, S. Ikonnikov).

3. **X. rupestre** (M. Pop. ex Nevski) Tzvel. comb. nova.—*Tanacetum rupestre* M. Pop. ex Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, IV (1937) 282.—*Chrysanthemum rupestre* (M. Pop. ex Nevski) Rech. f. in Koie and Rech. f. Symb. afghan. II (1955) 47, non Matsum. and Koidz. 1910.—*Cancrinia rupestris* (M. Pop. ex Nevski) Poljak. in Fl. Turkm. VII (1960) 104.—**lc.**: Nevski, op. cit. 285, fig. 8.

Perennial. 6–15 cm high semishrub with thick woody root, usually grayish from rather dense pubescence of appressed bifid hairs. Stem and leaves like previous species, but leaves usually more densely hairy, with usually entire segments; uppermost leaves entire, linear. Capitula usually numerous, one each at apices of leafy branches, on shorter (up to 3–4 cm long) erect peduncles. Involucre 4–5 mm in dia and 4.5–5.5 mm long, more or less hairy; involucre bracts with rather wide, dark-brown, membranous border, outer a fourth to a third as long as inner. Corolla of tubular florets yellow, 2.5–3.2 mm long. Achenes 1.8–2.5 mm long and about 0.6 mm wide; corona 1.2–1.6 mm long, entire, 288 unilateral, apically irregularly truncate or obtuse. Flowering July to August.

Stony and rubbly slopes, rocks; from 2,000 to 3,000 m.—*Soviet Central Asia*: Pamiro-Alai (Kugitang Mountains). *General distribution*: Afghanistan(?). Described from Kugitang. Type and isotype in Leningrad.

Note. Apparently replaced in Afghanistan by the closely related species *X. polycladum* (Rech. f.) Tzvel. comb. nova (= *Chrysanthemum polycladum* Rech. f. op. cit. 47).

GENUS 1534. **Lepidolopha** Winkl.^{1,2}

Winkl. in Tr. Peterb. Bot. Sada, XIV (1893) 236.

Capitula homogamous, discoidal, florets tubular; involucre cylindrical, imbricate, 2–3-seriate; receptacle convex, glabrous; corolla regular, 5-toothed, with limb slightly broader than tube; anthers almost entire at base, with 2 very short cusps. Style branches, cylindrical above, weakly thickened, truncate, brushlike. Achenes compressed, linear, obpyramidal; pappus membranous, with 8–10 lanceolate scales, almost entire or 2–3-lobed. Shrubs with flowering shoots more densely leafy below, sparsely above; lower leaves ternate, upper entire. Capitula medium, in corymbose inflorescence.

Types of genus: *L. komarowii* Winkl.

The genus comprises 6 species endemic in Central Asia.

1. Capitula aggregated in dense corymbs, 5–20 on short peduncles, solitary stems bearing 3–5 capitula each; leaves deeply divided, upper entire 2.
- + Capitula aggregated in lax inflorescence, on long peduncles, or solitary; leaves scattered or entire 3.
2. Lobes of leaves 2.5–4.5 mm wide; achenes pyramidal, 4.0–4.5 mm long 1. **L. komarowii** Winkl.
- + Lobes of leaves 5–10 mm broad; achenes 3 mm long 2. **L. filifolia** Pavl.
3. Leaves not deeply ternate in broad lobes or deeply dissected and compound ternate with narrow-linear lobes 4.
- + Leaves entire; capitula in lax inflorescence, 8–9 mm long, 4 mm in dia 6. **L. fedtschenkoana** Knorr.
4. Capitula usually solitary, less often in clusters of 2–3; leaves deeply divided into linear lobes, 2.0–2.5 cm long and 1 mm wide, upper entire 5. **L. karatavica** Pavl.
- 289 + Capitula in more lax inflorescence on long peduncles 5.
5. Leaves more or less deeply ternate, with linear or linear-lanceolate lobes; lobes of lower leaves 1.0–1.5 cm long, 1.0–2.5 mm wide; upper leaves entire; capitula 9 mm long, 3 mm wide 4. **L. nuratavica** Krasch.
- + Leaves not deeply ternate, with rather wide lobes, 1.0–1.5 cm long, 3–5 mm wide; upper leaves both entire and incised; capitula 7–10 mm long, 5–7 mm wide 3. **L. mogoltavica** Krasch.

¹Treatment by O.E. Knorring.

²From the Greek words: *lepis*—scale, and *lophos*—crest; named for the nature of the pappus.

Section 1. Congestae Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 162.—Capitula smaller, cylindrical, on rather short peduncles, in groups of 5–20 in dense corymbs; stems solitary bearing 3–5 capitula each.

1. **L. komarowii** Winkl. in Tr. Peterb. Bot. Sada, XIII (1894) 234.—**Exs.:** GRF No. 1875.

Perennial. 15–35 cm high, branched semishrub, older branches covered with grayish bark, year-old stems erect, forked in middle and above, weakly pubescent, densely leafy in lower half. Leaves petiolate; lamina deeply divided, with linear or oblong lobes, 15–25 mm long, 2.5–4.5 mm wide, with prominent midrib; upper leaves entire; all leaves weakly pubescent. Capitula in corymbs on 5–10 mm long peduncle, cylindrical—7 mm long, 3 mm in dia. Involucre many-rowed, finely pubescent; outer involucre bracts broadly ovate, obtuse, 3 mm long, 2 mm wide; middle bracts 5 mm long, and 2 mm wide. Receptacle glabrous. Florets yellow at apex. Achenes pyramidal, 4.0–4.5 mm long; pappus coronate, 1.5–2.0 mm long, membranous, deeply divided, scales mostly entire, less often toothed. Flowering July to August.

Stony slopes.—*Soviet Central Asia*: Tien Shan (western Karatau Range), Pamiro-Alai. Described from Hissar Range. Endemic. Type in Leningrad.

2. **L. filifolia** Pavl. in Vestn. Akad. Nauk KazSSR (1950) 24.

Perennial. 25–45 cm high semishrub. Stem branched, old branches covered with grayish-brown bark, young weakly pubescent, densely leafy in lower half, densely or sparsely in middle; leaves deeply dissected, petiolate, with prominent midrib; leaf lobes linear, 2–3 cm long and 5–10 mm wide; upper leaves smaller, entire less often twice or thrice pinnate, 7–10 mm long. Capitula in dense corymbs, on short 5–9 mm long peduncles, small, cylindrical, 6–7 mm long and 2 mm in dia. Involucre many-rowed, densely scaly, outer and middle bracts 3 mm long and 2 mm wide, inner 4 mm long and 1 mm wide. Receptacle glabrous, flat. Florets yellow. Achenes 3 mm long, ribbed; pappus of membranous scales, divided up to base, or in turn lobed above or toothed, 1 mm long.

Rubby and stony slopes.—*Soviet Central Asia*: Tien Shan (western). Endemic. Described from western part of Karatau Range. Type in Alma-Ata; cotype in Leningrad.

Section 2. Divaricatae Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 182.—Capitula in depauperate, very lax inflorescence on long peduncles or solitary, only sometimes on separate stems crowded together at the top in twos or threes.

3. **L. mogoltavica** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 182.—*L. komarowii* Winkl. var. *mogoltavica* Krasch. in Bot. Mat. Gerb. Bot. Sada, III (1922) 79.—**Exs.:** H.F.A.M. No. 195, sub *L. komarowii* Winkl.

Perennial. 30–40 cm high semishrub, strongly branched, old branches covered with gray bark, year-old stems erect or slightly divergent, divaricate in upper half, puberulent, densely leafy below. Leaves weakly ternate, with subobtusate, rather wide lobes, 1.0–1.5 cm long and 3–5 mm wide, or leaves partly almost entire, spatulate, with prominent midrib, appressed hairy. Capitula cylindrical, 7–10 mm long, 5–7 mm in dia, on long peduncles, 2.5–3.5 cm long, in depauperate corymbs of 2–3, or solitary. Involucre many-rowed, compact, grayish-pubescent; outer involucral bracts 3–5 mm long, 2.5 mm wide, middle 5–5.5 mm long and 3 mm wide, inner 6 mm long and 1.5 mm wide. Receptacle glabrous, flat. Florets yellow, more or less glandular. Achenes ribbed; pappus coronate, of scales incised or 2–3 toothed. Flowering June.

Sandstone and limestone mountain slopes.—*Soviet Central Asia:* Pamiro-Alai. Endemic. Described from Mogoltau Mountains. Type in Leningrad.

4. **L. nuratavica** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 179; **Ic.:** *ibid.* 181, Fig. 11.—**Exs.:** Gerb. Fl. SSSR No. 3360.

Perennial. 80–100 cm high semishrub, strongly branched, old branches covered with grayish bark; solitary stems erect, forked in middle and above, appressed hairy, densely leafy below. Cauline leaves and leaves of nonfertile shoots petiolate, deeply ternate above, with linear or linear-lanceolate lobes, 1.0–1.5 mm long and 1.0–2.5 mm wide; upper leaves linear, entire, 5–15 mm long. Capitula in very lax inflorescence, on 2.0–3.5 cm long peduncle, narrow-cylindrical, 9 mm
291 long and 3 mm wide. Involucre many-rowed, grayish-pubescent; outer involucral bracts ovate-orbicular or subacute, 2–3 mm long and 2.0–2.5 mm wide, middle ovate-lanceolate, 3–5 mm long and 2–3 mm wide, subobtusate, inner lanceolate or linear-lanceolate, 5–8 mm long and 1 mm wide. Receptacle glabrous, flat. Florets yellow at apex, more or less glandular. Achenes obpyramidal, ribbed, glandular; pappus coronate, 1.5 mm long, of scales, more or less deeply 4–6-parted, incised, sometimes scales toothed or entire. Flowering July to August.

Stony mountain slopes, on exposed granite and limestone deposits.—*Soviet Central Asia:* Pamiro-Alai. Endemic. Described from the Nuratau Mountains. Type in Leningrad.

Note. This species is not always very sharply distinguishable from *L. mogoltavica* Krasch., and transitional forms with shorter peduncles as well as broader leaf lobes are found where they come in contact with each other.

5. ***L. karatavica*** Pavl. in Bull. Soc. Nat. Mosc. (1933) 127.—Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 182.

Perennial. Spreading 20–30 cm high semishrub, old branches covered with grayish bark, young branches weakly pubescent, densely leafy below. Leaves deeply incised or ternate into narrow linear lobes, 20–25 mm long and 1 mm wide, with prominent midrib, densely puberulent; upper leaves entire, linear, 7–9 mm long. Capitula usually solitary, less often in groups of 2–3 on long peduncles, 2–4 cm long, broadly cylindrical, up to 10 mm and more long and up to 1 cm in dia. Involucre compact; involucre bracts many-rowed, outer 3 mm long and 3 mm wide, middle 6 mm long and 3.5 mm wide, inner 8 mm long and 2 mm wide. Receptacle flat, glandular-hairy. Corolla yellow. Achenes 3–3.5 mm long, ribbed, with raised glandular hairs; pappus of scales divided of lobed. Flowering June to July.

Stony and rubbly mountain slopes.—*Soviet Central Asia*: Tien Shan (western). Described from the Karatau Mountains. Type in Moscow.

6. ***L. fedtschankoana*** Knorr. in Bot. Mat. XIX (1959) 382.

Perennial. 25–35 cm high semishrubs, divaricately branched, with numerous stems; old branches covered with dark gray bark, year-old branches slightly deflected, yellowish brown, puberulent, leafy from base to middle. Leaves entire, linear, with grooved midrib, pubescent; lower leaves 25 mm long and 2.5–3.5 mm wide; leaves below inflorescence 3.0–3.5 mm long and 0.5 mm wide. Capitula on more or less long peduncle, in depauperate cylindrical inflorescence, 8–9 mm long, 4 mm in dia. Involucre many-rowed; outer involucre bracts 4 mm long and 2 mm wide, middle 5 mm long and 2 mm wide, inner 6 mm long and 1.5–2 mm wide. Receptacle flat. Florets yellow. Achenes 292 obpyramidal, with sunken ribs, 3.5 mm long; pappus coronate, 1.5–2.0 mm long, of scales, lobed up to base, apically entire or short-toothed.

In mountains at 1,800 m.—*Soviet Central Asia*: Pamiro-Alai (western part). Described from Kugitang Mountains. Endemic. Type in Leningrad.

1. **C. krascheninnikovii** (Rubtz.) Tzvel. comb. nova.—*Brachanthemum krascheninnikovii* Rubtz. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 208.—*Pyrethrum krascheninnikovii* (Rubtz.) Pavl. in Vestn. Akad. Nauk Kazakhsk. SSR, 5 (1952) 93.—*Cancrinia krascheninnikovii* (Rubtz.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 371.—**lc.**: Rubtz. op. cit. 209.

Perennial. Plants 3–10 cm high, with thick many-branched root, grayish-green or dull green from dense pubescence of long, erect, simple hairs; branches numerous, usually closely clustered, strongly reduced, densely covered with sheaths of dead leaves and terminating into leafy rosula. Leaves up to 1.5 cm long and 0.5 cm wide, usually grayish-green from dense pubescence, lacking punctate-glandular hairs, on rather long (sometimes longer than lamina), petiole strongly thickened at base, with pinnately or palmately 3–7-parted laminas, cuneately narrowed to petiole; terminal lobes oblong to narrow-linear, up to 1.2 mm wide, obtuse or subacute. Capitula solitary (but numerous on a single plant), on long (2–8 cm long), erect, leafless or almost leafless (with 1–2 narrow-linear leaves) peduncles, arising from leafy rosulas. Involucre 6–10 mm in dia, 3.5–6.0 mm long; involucre bracts almost equal. Corolla of tubular disk florets 2.2–3.0 mm long. Achenes 2.4–2.8 mm long, about 0.6–0.7 mm wide, with 10 prominent longitudinal ribs and 0.4–0.6 mm long corona. Flowering May to June. (Plate XIII, Fig. 2.)

Rubby and stony slopes of lower mountain zone.—*Soviet Central Asia*: Lake Balkhash Region (Chu-Ili Mountains). Endemic. Described from Chu-Ili Mountains. Type and isotype in Leningrad.

GENUS 1536. **Cancrinia** Kar. and Kir. Emend., Tzvel. ^{1,2}

Kar. and Kir. in Bull. Soc. Nat. Mosc. XV(1842) 124.—*Lepidolopsis* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 374 p. p.

Capitula usually quite numerous, up to 40, less often (section *Polychrysum* up to 80–100, in lax or more or less dense corymbs or 294 corymbose-panicles, or solitary (section *Cancrinia*), homogamous, with numerous, bisexual, tubular disk florets. Involucre patelliform, less often (section *Polychrysum*) cupuliform, 3–17 mm in dia and 3–6 mm long; involucre bracts herbaceous, imbricate, in 3–4 (less often almost 2) irregular rows; outer bracts lanceolate-linear or lanceolate, sometimes

¹Treatment by N.N. Tzvelev.

²Named for the Finance Minister E.F. Cancrin (1774–1845), who helped in some scientific investigations; C.F. Ledebour dedicated *Flora Rossica* to him.

few, inner 1.5–2 times as long, lanceolate-oblong to broadly linear; all bracts with more or less distinct light colored or dark membranous border; innermost bracts often very narrow, resembling floral bracts, sometimes merging with outer bracts. Receptacle strongly or weakly convex, solid, glabrous or sparsely pubescent, weakly punctate-tuberculate, sometimes distinctly alveolate. Corolla of tubular disk florets yellow, 1.2–3.0 mm long, with short wide tube, rather strongly and abruptly broadened in upper half, with 5 slightly decurved triangular or lanceolate-triangular teeth, a fifth to a third as long as tube. Filaments thickened in upper part; anthers lacking distinct basal appendage but with lanceolate-ovoid subobtuse apical appendage; pollen grains spherical, spiny. Styles bifid; their branches linear, truncate. All achenes similar, glabrous, less often sparsely hairy (section *Cancrinia*), prismatic-terete, narrowed toward base, 1.3–2.4 mm long, about 0.6–0.8 mm wide, with 5, less often 6–7, prominent longitudinal ribs (sometimes more or less converging on ventral side of outer achenes); pappus 0.4–1.0 mm long, less often (section *Cancrinia*) up to 3 mm long, as corona, often divided up to base in lobes or scales (usually as many as ribs) or various shapes and size. Perennial herbs, more or less covered with long simple hairs (in section *Tanacetopsis* sometimes mixed with bifid hairs), usually with short vegetative shoots, more sparsely leafy, antrorse (sometimes strongly reduced) cauline and alternate leaves with pinnately cut, less often palmately cut lamina.

Apparently, the genus, includes about 30 species, distributed in the mountainous regions of Central and Middle Asia from the Altai in the north to Afghanistan in the south. Of these, 17 species are found in the USSR.

Type of genus: *Cancrinia chrysocephala* Kar. and Kir.

Note. In the circumscription accepted by us, this genus occupies, as it were, an intermediate position between the genera *Pyrethrum* Zinn and *Tanacetum* L. Perhaps, it is closer to the former genus, differing from it mainly in the absence of ligulate florets. As stated earlier (cf. note to the genus *Pyrethrum* Zinn), *Pyrethrum majus* (Desf.) Tzvel. a species with homogamous capitula, which arose in cultivation, could be formally included in the genus *Cancrinia*, and generally there is a basis to consider *Cancrinia* as having originated from the ancestral type with white or pink ligulate florets by their complete reduction. Nevertheless, keeping in mind that on the basis of other characters (e.g., shape of corolla) *Cancrinia* is a fully isolated group of species with a definite area of distribution, we prefer to consider it as a separate genus. From the other closely related genus, *Tanacetum* L., *Cancrinia* differs mainly by having homogamous capitula as well as involucre almost always patelliform and not cupuliform. Besides, the slight



tendency towards hairiness of the achenes and receptacle in *Cancrinia*, which would seem to associate it with the genus *Trichanthemis* Rgl. and Schmalh., must be noted, as it is never found in the genera *Pyrethrum* and *Tanacetum*.

The genus is divided into four completely isolated sections, which, perhaps, would be treated more properly as independent genera. However, in my opinion, there is no doubt about their close affinity which, in particular, is confirmed by the similarity in structure of the florets and achenes and, according to the observations of V.A. Simanovich, also the pollen grains.

1. Capitula 3–4 mm in dia, always numerous (up to 100), in dense corymbs. Plants up to 150 cm high. (sect. *Polychrysum*.) 1. **C. tadshikorum** (Kudr.) Tzvel.
- + Capitula 6–17 mm in dia, less numerous. Plants up to 60 cm high...2.
2. Corona of achenes 2.3–3 mm long, divided into 8–12 linear or lanceolate-linear scales; achenes more or less sparsely hairy. Plants up to 10 cm high with solitary capitula. (sect. *Cancrinia*) 3.
- + Corona 0.4–1.5 mm long, entire or divided; achenes glabrous ... 4.
3. Achenes sparsely hairy all over. Central Tien Shan 18. **C. tianschanica** (Krasch.) Tzvel.
- + Achenes sparsely hairy only at apex. Dzhungarian Alatau 17. **C. chrysocephala** Kar. and Kir.
4. Receptacle strongly convex, conically hemispherical; corolla tube very short and wide. Biennial, less often perennial (?) plants 5–20 cm high, with slender root, which is easily pulled out, and solitary capitula. (sect. *Matricarioides*.) 16. **C. discoides** (Ldb.) Poljak.
- + Receptacle usually weakly convex; corolla tube narrower. Perennial (8) 15–60 cm high plants with thicker roots and usually numerous, less often solitary capitula. (sect. *Tanacetopsis*.) 5.
5. Corona of achenes about 0.1 mm long, subobtusely small toothed along margin; capitula numerous (more than 20), at apices of divaricate branches of wide lax panicle. Paropamisus Mountains (Turkmenian SSSR) 14. **C. paropamisica** (Krasch.) Tzvel.
- 298 + Corona of achenes 0.3–1.5 mm long, more or less (often up to base) divided into lobes of various shapes and sizes 6.
6. Stem densely lanate-tomentose at base in axils of sheaths of dead leaves 7.
- + Stem not tomentose at base 11.
7. Capitula 10–40, in more dense, compound corymbs; leaves glabrous or subglabrous. Trans-Ili and Dzhungarian Alatau 2. **C. goloskokovii** (Poljak.) Tzvel.

- + Capitula fewer, usually up to 10, less often up to 15 on a single stem, leaves more or less hairy. Other regions 8.
- 8. Corolla densely hairy in upper part 9.
- + Corolla glabrous 10.
- 9. Corona of achenes 0.3–0.6 mm long, irregularly toothed up to middle. Turkestan and Zeravshan 11. **C. urgutensis** (M. Pop.) Tzvel.
- + Corona of achenes 0.6–1 mm long, usually divided up to base in acuminate unequal lobes. Western spurs of Hissar Range 12. **C. botschantzevii** (Koval.) Tzvel.
- 10. Achenes 1.2–1.5 mm long; leaves dull green from sparser pubescence. Gissar, Darvaz, Vakhsh and other ranges 10. **C. pamiroalaicum** (Koval.) Tzvel.
- + Achenes 1.8–2.4 mm long; leaves usually grayish-green from sparse tomentum. Kugitang and Daisuntau mountains 13. **C. nevskii** Tzvel.
- 11. Capitula solitary or 2–5, on long deflexed peduncles, usually not in regular corymb. Plants of plains and lower hills, 8–30 cm high, with more slender taproot 15. **C. sentoana** (Krasch., M. Pop. and Vved.) Poljak.
- + Capitula usually more numerous. Taller (20–70 cm tall), mountain plants with thick many-branched root 12.
- 12. Capitula on shorter (usually to 3, less often to 6 cm long) peduncle, in regular and rather dense corymbs 13.
- + Capitula on longer (to 10–15 cm) peduncles, in very lax corymbose-panicles, less often (in *C. mucronata* var. *corymbulosa*) more dense 15.
- 13. Leaves glabrous or subglabrous. Karatau and Nuratau mountains ... 9. **C. karatavica** Tzvel.
- + Leaves densely hairy 14.
- 14. Lobes of corona on achenes obtuse. Shugnan Range 3. **C. subsimilis** (Rech. f.) Tzvel.
- 299 + Lobes of corona on achenes acuminate. Karatau Mountains 8. **C. pjataevae** (Koval.) Tzvel.
- 15. Only innermost involucre bracts with very narrow, membranous border along margin and apex, others lacking border. Western Tien Shan 7. **C. submerginata** (Koval.) Tzvel.
- + Middle and inner involucre bracts with rather wide membranous border along margin 16.
- 16. Outer involucre bracts numerous, very narrow, more or less linear-subulate, usually lacking membranous border. Fergana and Chatkal ranges 6. **C. ferganensis** (Koval.) Tzvel.

- + Outer in involucre bracts few, wider, lanceolate or lanceolate-linear, usually with narrow membranous border. Pamiro-Alai 17.
- 17. Leaves sparsely hairy (to subglabrous) with terminal segments up to 1 mm wide; involucre appressed hairy; outer involucre bracts not less than two-thirds as long as inner 5. **C. setaces** (Rgl. and Schmalh.) Tzvel.
- + Leaves densely hairy, with terminal segments up to 0.6 mm wide; involucre sparsely hairy, often subglabrous; outer involucre bracts a half to two-thirds as long as inner 4. **C. mucronata** (Rgl. and Schmalh.) Tzvel.

Section 1. Polychrysum Tzvel. sect. nova in Addenda, XXV, 876.—Perennial, monocarpic, 30–150 cm high plants. Capitula rather numerous (more than 40), at stem apices in dense corymbs, up to 25 cm in dia; involucre cupuliform, 3–4 mm in dia; receptacle as flat arola near margin, weakly convex in middle, glabrous, punctate-tuberculate, but distinctly alveolate; corolla tube usually with short glandular hairs in lower, narrower half. Achenes 1.3–1.8 cm long, rather densely covered with very short, glandular hairs; corona 0.4–0.7 mm long, lobed almost to base.

A monotypic section.

Note. The most isolated section of the genus which, apparently, deserves to be split off as a separate genus. Its only species is morphologically very similar to the species of *Hendelia* Heimerl. and *Pseudohandelia* Tzvel.; however, according to the structure of the achenes, florets, and pollen grains, it is much closer to the species of section *Tanacetopsis* Tzvel. of *Cancrinia*, with which I, too, relate it.

1. **C. tadshikorum** (Kudr.) Tzvel. comb. nova.—*Tanacetum tadshikorum* Kudr. in Bull. Univ. As. Centr. XIX (1934) 163.—*Chrysanthemum tadshikorum* Kudr. ibid. 163, in syn., nom. altern.—*Pyrethrum tadshikorum* Kudr. ibid. 163, in syn., nom. altern.—*Lepidolopsis tadshikorum* (Kudr.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 375.—**Ic.:** Kudr. op. cit. 169.

Perennial. Monocarpic, 30–150 cm high plant, with thick taproot, more or less sparsely floccose-tomentose with long, flexuous, simple hairs. Stem usually solitary, erect, strongly thickened at base and covered with numerous sheaths of dead leaves with dense tomentum in their axils, more sparsely leafy, branched only at apex (in inflorescence). Leaves more or less grayish from lax tomentum, with inconspicuous punctate-glandular hairs; basal leaves 30–35 cm long, 10 cm wide, often withering before flowering, on petioles strongly thickened at base, but often with reduced lateral segments close to their base, with

2–4-pinnately cut lamina, oblong, or linear-oblong; apical lobes somewhat thick, lanceolate or linear-lanceolate, usually to 1 mm, less often to 1.5 mm wide, gradually narrowed toward apex into rather long, cartilaginous cusp; lower cauline leaves like basal, middle and upper reduced, sessile. Capitula quite numerous (more than 40), in dense, compound, corymbs, to 25 cm in dia. Involucre 3–4 mm in dia and 3–4 mm long, usually pubescent to subglabrous; involucre bracts herbaceous, outer lanceolate-subulate, more or less lacking border, inner linear, 1.5–2 times as long, with rather wide, light colored, membranous border. Corolla of tubular florets 2.3–3 mm long, usually covered in lower half with short-stalked glandular hairs. Achenes 1.3–1.8 mm long, about 0.4 mm wide, with 5–7 longitudinal ribs; corona 0.4–0.7 mm long, irregularly divided almost up to base into subulate lobes of various shapes and sizes. Flowering May to July.

Gravel beds, stony slopes, scrubs in lower and middle mountain zones.—*Soviet Central Asia*: Pamiro-Alai (western Tadzhikistan ranges). Endemic. Described from Hissar Range. Type in Tashkent.

Section 2. *Tanacetopsis* Tzvel. sect. nova in Addenda, XXV, 876.—Perennial, 20–70 cm high polycarpic plants. Capitula usually numerous, (1)2–25(40), in lax, less often dense, corymbose-panicles or corymbs; involucre patelliform, 6–14 mm in dia; receptacle weakly convex, punctate-tuberculate, glabrous, less often sparsely hairy; corolla tube shorter and wide, usually glabrous (hairy in two species). Achenes 1–2.4 mm long, glabrous; corona 0.1–1.5 mm long, often strongly truncate (narrower on ventral side), more or less divided along margin into lobes of various shapes and sizes or irregularly toothed.

Type of section: *Cancrinia mucronata* (Rgl. and Schmalh.) Tzvel.

Note. The largest section of the genus, like section *Xanthoglossa* (DC.) Sch. Bip. of the genus *Tanacetum* L., comprising a large number of close ecogeographical races, which are often difficult to distinguish.

301 The species of the section, also similar in their habit to those of section *Xanthoglossa*, are easily distinguished from them by their homogamous capitula, patelliform involucre (at anthesis), and pubescence consisting almost exclusively of simple hairs.

Series 1. *Goloskokoviae* Tzvel.—Stem tomentose at base in axils of sheaths of dead leaves; capitula 10–40, in regular corymbs; corona of achenes 0.4–0.6 mm long, strongly truncate and 5–7-lobed up to base.

2. ***C. goloskokovii*** (Poljak.) Tzvel. comb. nova.—*Lepidolopsis goloskokovii* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 376.

Perennial. Plants 30–70 cm high, with thick many-branched rhizome, usually with occasional, long, simple hairs to more or less glabrous. Stems more or less numerous, erect, sparsely leafy, whitish-tomentose at base in axils of sheaths of dead leaves, branched only above. Leaves glabrous or subglabrous, lacking distinct punctate glandular hairs; basal leaves up to 25 cm long and 3–4 cm wide, on rather long, basally thickened petiole, with twice or thrice pinnately cut, broad linear lamina; terminal segments linear or lanceolate, up to 1.2 mm wide, and 1–6 mm long, with short cartilaginous cusp; cauline leaves like basal, but smaller, middle and upper sessile. Capitula 10–40, on up to 2.5 cm long peduncle, less often to 5 cm, in compound corymbs. Involucre 6–9 mm in dia, 3.5–4 mm long, glabrous or subglabrous; involucre bracts herbaceous, outer broadly lanceolate, subobtusate, almost lacking border, inner 1.5–2 times as long, oblong-linear, with rather wide, light colored, membranous border, appendiculately broadening at apex. Corolla of tubular florets 1.8–2.2 mm long. Achenes 1.0–1.2 mm long, about 0.4 mm wide, with 5–7 longitudinal ribs; corona strongly truncate, 0.4–0.6 mm long, inequally 5–7 lobed up to base. Flowering June to July.

Stony slopes, rocks in middle mountain zone.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Belgair Mountains in Dzhungarian Alatau), Tien Shan (eastern spurs of Trans-Ili Alatau). Endemic. Described from Trans-Ili Alatau. Type and isotypes in Leningrad; isotypes in Alma-Ata.

Series 2. Mucronatae Tzvel.—Stems not tomentose at the base; capitula (1)2–15(20), in lax corymbose-panicles or corymbose-racemes, less often in regular corymbs; corona of achenes 0.4–1.5 mm long, more or less truncate and divided up to middle or base in lobes of various shapes and sizes, less often irregularly toothed.

302 3. **C. subsimilis** (Rech. f.) Tzvel. comb. nova.—*Chrysanthemum subsimile* Rech. f. in Koie and Rech. f. Symb. afghan. II (1955) 49.—*Tanacetum subsimile* (Rech. f.) Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 23.—**IC.**: Rech. f. op. cit. 50, fig. 39.

Perennial. Plants 25–60 cm high, with thick many-branched rhizome, dull green or grayish-green from rather dense pubescence of long, erect, simple hairs. Stems usually rather numerous, erect or ascending at base, sparsely leafy, more or less branched mainly above. Leaves dull-green or grayish-green from rather dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves up to 15 cm long and 3 cm wide, on rather long, petiole strongly thickened at base, with

2–3 pinnatisect broadly linear or oblong-linear lamina, terminal segments lanceolate or linear, somewhat thick, up to 1 mm wide, with rather long cartilaginous cusp; cauline leaves like basal but reduced, middle and upper sessile. Capitula (1)2–10(12), on up to 1–1.5 cm long peduncle in rather dense, compound corymbs, sometimes almost umbellate. Involucre 7–11 mm in dia, 3.5–5.0 mm long, more or less pubescent; involucre bracts herbaceous, outer lanceolate, with narrow membranous border, inner 1.5–2 times as long, oblong-linear, with wide, brownish, usually light colored border, appendiculately broadened at apex. Corolla of tubular florets 2.0–2.4 mm long. Achenes 1.6–2.2 mm long and about 0.6 mm wide, with 5–6 longitudinal ribs; corona distinctly truncate, 0.5–0.9 mm long, divided up to middle or slightly deep in to wide obtuse lobes or various shapes and sizes. Flowering July to August.

Screes, rocks, stony slopes above 3,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (region of Shugnan Range). *General distribution*: Iran-Afghanistan (Afghanistan). Described from Afghanistan. Type in Vienna.

Note. The species was repeatedly collected from the Shakh-Dara River basin, but reported as a new species for the USSR only recently by S.S. Kovalevskaya. Specimens from the USSR correspond fully to the original description and diagram of the species.

4. **C. mucronata** (Rgl. and Schmalh.) Tzvel. comb. nova.—*Pyrethrum mucronatum* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 619, p. p.; O. and B. Fedtsch. Perech. Rast. Turk. IV, 187.—*Chrysanthemum mucronatum* (Rgl. and Schmalh.) Minkw. and Knorr. Rast. Chimkentsk. Uezda (1910) 112; B. Fedtsch. Rast. Turk. 737.—*Tanacetum mucronatum* (Rgl. and Schmalh.) M. Pop. in Tr. Uzbeksk. Gos. Univ. Nov. Ser. No. 27, Biol. XIV (1940) 80.—*Lepidolopsis mucronata* (Rgl. and Schmalh.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 375.—Exs.: GRF No. 3267.

303 Perennial. Plants 20–50 cm high, with thick many-branched rhizome, dull green from sparse pubescence of long, erect, simple (mixed with bifid) hairs. Stems usually numerous, erect or ascending at base, sparsely leafy, more or less branched above middle. Leaves dull green from sparse pubescence, besides short papillae, with inconspicuous punctate-glandular hairs; basal leaves up to 15 cm long, 3 cm wide, on rather long petiole basally strongly thickened, with twice or thrice pinnately cut oblong-linear lamina; terminal segments lanceolate or narrow-linear, up to 0.6 mm wide, somewhat thick, with rather long cartilaginous cusp; cauline leaves strongly reduced, middle and upper (often also lower) sessile. Capitula (1)2–10(12), on long (up

to 10–15 cm long) slender peduncles arising from axils of upper leaves, in depauperate corymbose-raceme of corymbose-panicles, less often in more dense corymbs (var. *corymbulosa* Winkl.). Involucre 7–10(12) mm in dia, 3–4 mm long, more or less sparsely hairy to subglabrous; involucre bracts herbaceous, outer lanceolate, with narrow membranous border, inner 1.5–2 times as long, oblong-linear, with wide, brownish, usually light colored, membranous border, appendiculately broadened at apex. Corolla of tubular florets 1.8–2.5 mm long. Achenes 1.6–2.4 mm long, about 0.6 mm wide, with 5, less often 6–7, longitudinal ribs; corona slightly truncate, 0.8–1.5 mm long, divided up to or almost to base into 4–7 unequal, more or less aristate lobes. Flowering July to August.

Scree, rocks, stony slopes above 2,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (Kugitang, Hissar, Zeravshan, and Turkestan ranges). Endemic. Described from the Zeravshan River basin. Lectotype (collections of O. Fedtschenko) in Leningrad; isotypes in Taskents.

Note. This polymorphic species was divided only very recently by S.S. Kovalevskaya into several completely separate ecogeographical races, differing mainly in the position of the capitula and the structure of the involucre. Possibly specimens with a denser and almost regular corymbose inflorescence are close to the previous species and form the particular higher mountain race, called "*Tanacetum mucronatum* var. *corymbulosum* Winkl." in the herbarium of C. Winkler. Their range coordinates fully with that of the typical form.

Very close to it is the Afghan species *C. tripinnatifida* (Oliv.) Tzvel. comb. nova. [= *Tanacetum tripinnatifidum* Oliv. in Hook Icon. pl. XXIV (1894) t. 2306], which differs from *C. mucronata* by having weaker pubescence and longer terminal segments of the leaves. The isotype of *C. tripinnatifida* is preserved in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR.

5. *C. setacea* (Rgl. and Schmalh.) Tzvel. comb. nova.—*Pyrethrum setaceum* Rgl. and Schmalh. in Izv. Obshch. Lyubit. Estestv., Antrop. i E'tnogr. XXXIV, 2 (1882) 44; O. and B. Fedtsch. Perech. Rast. Turk. IV, 187.—? *P. setifolium* Rgl. in Delect. Sem. Horti. Petrop. (1876) 36, nom. nud.; Trautv. in Tr. Peterb. Bot. Sada. VIII, 2, 456, nom. nud.—*Tanacetum setaceum* (Rgl. and Schmalh.) Oliv. in Hook. Icon. pl. XXIV (1894) sub tab. 2306 in obs. non Tausch. 1829.—*T. regelii* Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 27, nom. nov.—*Chrysanthemum setaceum* (Rgl. and Schmalh.) B. Fedtsch. Rast. Turk. (1915) 737.—*Lepidolopsis setacea* (Rgl. and Schmalh.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 376.

Perennial. Plants 25–70 cm high, with thick many-branched rhizome, usually covered with long, flexuous simple (mixed with bifid) hairs, sometimes subglabrous. Stems usually rather numerous, erect or ascending at base, sparsely leafy, more or less branched above. Leaves green, more or less sparsely hairy to subglabrous, with inconspicuous punctate-glandular hairs; basal leaves 25–30 cm long, 6 cm wide, otherwise like previous species, but terminal segments usually broader (up to 1 mm wide). Capitula (1)4–12(15); on long (up to 15 cm) slender peduncles arising from axils of upper leaves, in depauperate corymbose-panicles (rarely racemes). Involucre 7–10(12) mm in dia and 3–4 mm long, with semi-erect hairs at base and dorsally; involucre bracts herbaceous, outer narrow-lanceolate, usually lacking membranous border, inner not more than 1.5 times as long, oblong-linear, with rather wide, light colored or brownish, membranous border, appendiculately broadened at apex. Corolla of tubular florets 2–3 mm long. Achenes 1.5–2.5 mm long, more or less 0.6 mm wide, with 5–7 longitudinal ribs and weakly truncate 0.8–1.3 mm long corona, divided to or almost to base into 4–7 aristate-toothed lobes. Flowering July to August.

Rocks, stony slopes above 2,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (northern slope of Turkestan Range and western Alai Range). Endemic. Described from Turkestan Range. Type in Leningrad.

6. **C. ferganensis** (Koval.) Tzvel. comb. nova.—*Tanacetum ferganense* Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 31.—*Pyrethrum mucronatum* auct. p. p.

305 Perennial. Plants 25–60 cm high, with thick many-branched rhizome, more or less covered with short and long, erect, simple (mixed with bifid) hairs. Stems usually rather numerous, erect or ascending at base, sparsely leafy, more or less branched above. Leaves usually dull-green from rather dense pubescence, with quite distinct punctate-glandular hairs; basal leaves 18–20 cm long, 5–6 cm wide, on rather long petiole, strongly thickened at base, with twice or thrice pinnately cut, oblong or linear-oblong lamina; terminal segments lanceolate or linear, up to 1 mm wide, with very short, cartilaginous cusp; cauline leaves strongly reduced, except lowermost sessile. Capitula (1)2–6(1), on long (up to 10–15) slender peduncles, in depauperate corymbose-racemes. Involucre 7–14 mm in dia; 3–4 mm long, more or less hairy; involucre bracts herbaceous, outer numerous, lanceolate-linear, lacking border, inner not more than 1.5 times as long, oblong-linear, with wide, light-colored, membranous border, more or less broadened at apex. Corolla of tubular florets 1.8–2.5 mm long. Achenes 1.8–2.4 mm long, about 0.6 mm across, with 5–7 longitudinal ribs and distinctly truncate 0.8–1.2 mm long corona, divided up to or almost to base into

more or less aristate-toothed lobes of various shapes and sizes. Flowering July to August.

Rocks, stony slopes above 2,000 m.—*Soviet Central Asia*: Tien Shan (Fergana and Chatkal ranges). Endemic. Described from Chatkal Range. Type in Tashkent.

7. **C. submarginata** (Koval.) Tzvel. comb. nova.—*Tanacetum submarginatum* Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk. Uzb. SSR, XVI (1961) 30.—*Pyrethrum mucronatum* auct. p. p.

Perennial. 25–60 cm high plants, with thick many-branched rhizome, more or less covered with long, erect, simple (mixed with bifid) hairs. Stems usually rather numerous, erect or ascending at base, sparsely leafy, more or less branched above. Leaves green, usually sparsely hairy, with inconspicuous punctate-glandular hairs; basal leaves up to 15 cm long and 4 cm wide, on rather long petiole strongly thickened at base, with twice or thrice pinnately cut, usually oblong lamina; terminal segments lanceolate or lanceolate-linear, up to 1.2 mm wide, with rather long, cartilaginous cusp; cauline leaves strongly reduced, lowermost sessile. Capitula (1)3–12(15), on long (up to 10–15), slender peduncles, in depauperate corymbose-racemes or corymbose panicles. Involucre 6–10 mm in dia, 3–4 mm long, more or less hairy to subglabrous; involucre bracts herbaceous, outer numerous, lanceolate-linear or lanceolate-subulate, like middle, lacking membranous border, inner oblong-linear, 1.5, less often 2 times as long, with very narrow light-colored, membranous border; corolla of tubular florets 1.8–2.5 mm long. Achenes 1.6–2.2 mm long, 0.6–0.8 mm wide, with 5, less often 6–7, longitudinal ribs and slightly truncate 0.7–1.2 mm long corona, divided to or almost to base into more or less aristate-toothed lobes of various shapes and sizes. Flowering July to August.

306 Rocks, stony slopes above 2,000 m.—*Soviet Central Asia*: Tien Shan (Pskem, Ugam, Chatkal, and Tashkent Alatau ranges). Endemic. Described from Tashkent Alatau (Greater Chimgan). Type in Tashkent.

8. **C. pjataevae** (Koval.) Tzvel. comb. nova.—*Tanacetum pjataevae* Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 27.—*Pyrethrum mucronatum* auct. p. p.

Perennial. Plants 20–50 cm high, with thick, many-branched rhizome, dull green from sparse pubescence of long, erect, simple (sometimes mixed with bifid) hairs. Stems usually rather numerous, erect or ascending at base, sparsely leafy, more or less branched above middle. Leaves dull green from sparse pubescence. Often also with short papillae, with inconspicuous punctate-glandular hairs; basal leaves

up to 15 cm long, 3 cm wide, on rather long, basally strongly thickened petiole, with twice or thrice pinnately cut, oblong-linear lamina; terminal segments lanceolate or lanceolate-linear, up to 1 mm wide, with rather long, cartilaginous cusp; cauline leaves strongly reduced, middle and upper sessile. Capitula (1)5–15(20), on peduncles up to 4 cm, less often to 6 cm long, in depauperate compound corymbs. Involucre 7–10 mm in dia, more or less hairy; involucre bracts herbaceous, outer lanceolate-linear, lacking membranous border, inner oblong-linear, 1.5 times, less often 2 times as long, with quite wide, light-colored, membranous border. Corolla of tubular florets 1.8–2.5 mm long. Achenes 1.3–1.8 mm long, about 0.6 mm wide, with 5, less often 6–7 longitudinal ribs and weakly truncate 0.4–1.0 mm long corona, divided up to or almost to base into more or less aristate-toothed lobes of various shapes and sizes. Flowering June to August.

Rocks, stony slopes above 2,000 m.—*Soviet Central Asia*: Tien Shan (Karatau Mountains). Endemic. Described from Central Karatau. Type in Tashkent.

9. *C. karatavica* Tzvel. nomen. novum.—*Tanacetum karataviense* Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 28, non *Cancrinia karataviensis* Poljak., 1959.

307 Perennial. Plants 20–50 cm high, with thick, many-branched root, usually covered with sparse, long, erect, simple hairs, sometimes glabrous. Stems usually rather numerous, erect or ascending at base, sparsely leafy, more or less branched above. Leaves like previous species, but glabrous or subglabrous (with occasional hairs on midrib) and with rather numerous punctate-glandular hairs. Capitula (1)5–15(20), on up to 2 cm, less often 4–5 cm long peduncles, more or less dense, compound corymb. Involucre 6–8(10) cm in dia and 3–4 mm long, glabrous; involucre bracts herbaceous, outer lanceolate-linear, lacking membranous border, inner oblong-linear, 1.5 times, less often 2 times as long, with quite wide, light-colored, membranous border. Corolla of tubular florets 1.8–2.4 mm long. Achenes 1.5–2.0 mm long and about 0.6 mm wide, with 5, less often 6–7, longitudinal ribs and weakly truncate 0.4–1.0 mm long corona, divided to or almost to base into more or less aristate-toothed lobes of various shapes and sizes. Flowering May to July.

Rocks, stony slopes in middle mountain zone.—*Soviet Central Asia*: Tien Shan (Karatau Mountains), Pamiro-Alai (Nuratau and Aktau mountains). Endemic. Described from eastern Karatau. Type in Tashkent.

Note. The lowest montane ecogeographical race of the series. Despite the considerable gaps in the range, the specimens from Karatau

and Nuratau are very similar and were quite rightly placed in one species by Kovalevskaya.

Series 3. Pamiroalaicae Tzvel.—Stem densely lanate-tomentose at base in axils of sheaths of dead leaves; capitula (1)2–10(20) on a single stem, in depauperate corymbose-raceme or corymbose-panicle; corona of achene 0.3–0.7 mm long, more or less divided or irregularly toothed, sometimes strongly truncate.

10. **C. pamiralaica** (Koval.) Tzvel. comb. nova.—*Tanacetum pamiralaicum* Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 35.

Perennial. Plants 20–50 cm high, with thick many-branched rhizome, dull green from rather dense pubescence of long and short simple (with bifid) hairs. Stems usually rather numerous, erect, densely lanate-tomentose at base in axils of leaf sheaths, sparsely leafy, more or less branched above. Leaves dull green from rather dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves up to 15 cm long, 3 cm wide, on quite long (sometimes almost as long as lamina), petiole strongly thickened at base, with twice or thrice pinnately cut, usually oblong lamina; leaf segments 4–8 on each side, somewhat distant, with narrow rachis; terminal segments lanceolate to linear, to 1.2 mm wide, with short cartilaginous cusp; cauline leaves strongly reduced and less dissected except lower, sessile. Capitula (1)2–10(12), on quite long (up to 10 cm), slender peduncles, in depauperate corymbose-racemes or corymbose-panicle. Involucre 6–10 mm in dia and 3–4 mm long, more or less finely tomentose near base and dorsally on bracts; involucre bracts herbaceous, outer lanceolate, lacking membranous border, inner 1.5–2 times as long, oblong-linear, with quite narrow, but apically more or less broadened, light colored, membranous border. Receptacle glabrous. Corolla of tubular florets 1.8–2.3 mm long. Achenes 1.2–1.8 mm long and about 0.6 mm wide, with 5–7 longitudinal ribs and strongly truncate (lobes on ventral side almost a half as long as on dorsal) 0.4–0.7 mm long corona, divided almost to base into 5–7 irregularly toothed lobes. Flowering July to August.

Rocks, stony slopes, screes above 2,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (Darvaz, Vakhsh, Rushan, Yazgulem, and Hissar ranges). Endemic. Described from Hissar Range. Type in Tashkent.

Note. According to Kovalevskaya, it differs from the very close Afghan species *C. eriobasis* (Rech. f.) Tzvel. comb. nova. [= *Chrysanthemum eriobasis* Rech. f. in Koie and Rech. f. *Symb. afghan.* II (1955) 44] by having the capitula on much longer peduncles which are aggregated in very lax corymbose-racemes (and not rather dense corymbs).

11. **C. urgutensis** (M. Pop.) Tzvel. comb. nova.—*Pyrethrum urgutense* M. Pop. in Tr. Uzbeksk. Gos. Univ. Nov. Ser. No. 27, Biol. XIV (1941) 80, diagnosis in Russian and in Addenda, XXV, 874.—*Tanacetum urgutense* (M. Pop.) Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzbeksk. SSR, XVI (1961) 36.

Plants 18–40 cm high, with thick many-branched rhizome, dull green from rather dense pubescence of long, flexuous, simple hairs. Stems usually rather numerous, erect or ascending, densely lanate tomentose at base in axils of leaf sheaths, sparsely leafy, more or less branched above. Leaves dull green from rather dense pubescence, lacking punctate-glandular hairs; basal leaves up to 10 cm long, 2.5 cm wide, on rather long (sometimes almost as long as lamina) petiole, with twice or thrice pinnately cut, linear-oblong lamina; leaf segments distant, 4–8 on each side; terminal segments lanceolate or linear, up to 1 mm wide, with short cartilaginous cusp; cauline leaves strongly reduced and less divided except lower, sessile. Capitula (1)2–6(8), on long (up to 10–15 cm), slender peduncles, in very lax, corymbose-racemes. Involucre 7–12 mm in dia, 3.5–5 mm long, more or less appressed hairy; involucre bracts herbaceous, outer lanceolate, few, lacking membranous border, inner oblong-linear, 1.5 times, less often 2 times as long, with quite wide, light colored, membranous border. 309 Receptacle sparsely hairy, less often glabrous. Corolla of tubular florets 2.2–2.8 mm long, densely hairy in upper part. Achenes 2.0–2.4 mm long, about 0.6 mm wide, with 5, less often 6, longitudinal ribs and usually nontruncate 0.3–0.6 mm long corona, irregularly sharply toothed usually not more than to middle. Flowering June to August.

Rocks, stony slopes at 2,000–3,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (Turkestan and Zeravshan ranges). Endemic. Described from Zeravshan Range. Type in Tashkent.

Note. As also in the next species, the corolla densely hairy in the upper part, a character of wide occurrence in the genus *Trichanthemis* Rgl. and Schmalh. but not found in *Tanacetum* L. and *Pyrethrum* Zinn.

12. **C. botschantzevii** (Koval.) Tzvel. comb. nova.—*Tanacetum botschantzevii* Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 36.

Perennial. Plants 25–45 cm high, with thick many-branched rhizome, dull green or grayish-green from rather dense pubescence of flexuous simple hairs. Stems usually rather numerous, erect, lanate-tomentose at base in axils of sheaths of dead leaves, sparsely leafy, strongly branched from middle or below. Leaves lacking punctate-glandular hairs; basal leaves up to 10 cm long and 2 cm wide, on rather long petiole, with twice (sometimes more or less thrice) pinnately

cut, oblong-linear or broadly linear lamina; leaf segments including terminal segments like previous species; cauline leaves more or less reduced and less dissected. Capitula 3–8 on a single stem, on very long (up to 15 cm), slender peduncles in lax corymbose-racemes. Involucre 7–10 mm in dia, 3–4 mm long, more or less appressed hairy; involucre bracts like previous species. Receptacle sparsely hairy to subglabrous. Corolla of tubular florets 1.8–2.4 mm long, densely hairy above. Achenes 2.0–2.4 mm long, about 0.6 mm wide, with 5(6) longitudinal ribs and strongly truncate, corona 0.6–1.0 mm long, usually irregularly divided almost to base into unequal acuminate lobes. Flowering July.

Scree and rocks at 2,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (western spurs of Hissar Range). Endemic. Described from Baisuntau Mountains (upper reaches of Yakkabag-Darya River in vicinity of the village of Tash-Kurgan, 12.VII.1936, Nos. 902 and 910, V. Botschantzev and A. Butkov). Type in Tashkent.

13. *C. nevskii* Tzvel. nom. nov.—*Tanacetum krascheninnikovii* Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, IV (1937) 282, non *Cancrinia krascheninnikovii* (Rubtz.) Poljak. 1959.—*Lepidolopsis krascheninnikovii* (Nevski) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 376.—*lc.*: Nevski, op. cit. 283, fig. 7.

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Perennial. Plants 20–50 cm high, with thick many-branched rhizome, grayish or dull green from rather dense pubescence of long, flexuous, simple hairs. Stems usually rather numerous, erect, densely lanate-tomentose at base in axils of leaf sheaths; sparsely leafy, more or less branched above. Leaves usually grayish from dense, almost tomentose pubescence, with inconspicuous punctate-glandular hairs; basal leaves up to 20 cm long, 3–4 cm wide, on rather long petiole strongly thickened at base, twice or thrice pinnately cut, linear-oblong lamina; leaf segments quite distant, 4–10 on each side; terminal segments lanceolate or linear, up to 1.5 mm wide, somewhat thick, with very short cartilaginous cusp; cauline leaves strongly reduced and less dissected, except lower, sessile. Capitula (1)5–15(20), on rather long (up to 10 cm) peduncles in depauperate corymbose-racemes or corymbose-panicles. Involucre 6–10 mm in dia and 3–4.5 mm long, more or less finely tomentose to subglabrous; involucre bracts herbaceous, outer few, lanceolate-ovate, subobtusate, almost lacking membranous border, inner oblong-linear and oblong, 1.5 times, less often 2 times as long, with quite narrow, light colored, membranous border. Receptacle glabrous or sparsely hairy. Corolla of tubular florets 1.6–2.2 mm long. Achenes 1.8–2.4 mm long and 0.6–0.8 mm wide, with 5, less often 6, longitudinal ribs and weakly truncate 0.3–0.7 mm

long corona, divided almost up to base into longitudinal, more or less aristate-toothed lobes. Flowering June to July.

Stony slopes, rocks (especially on gypsum rocks) at 1,500–2,500 m.—*Soviet Central Asia*: Pamiro-Alai Region (Kugitang and Baisuntau mountains). Endemic. Described from Kugitang Mountains. Type and isotypes in Leningrad.

Series 4. Platyrachides Tzvel.—Stems densely lanate-tomentose at base in axils of sheaths of dead leaves. Capitula numerous (more than 20 on a single stem), at apices of divaricate branches in very lax, panicles or corymbose-panicle; corona of achenes about 0.1 mm long, blunt-toothed along margin.

14. **C. paropamisica** (Krasch.) Tzvel. comb. nova.—*Pyrethrum paropamisicum* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 166.—*Lepidolopsis paropamisica* (Krasch.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 376.—*Tanacetum paropamisicum* (Krasch.) Koval. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk Uzb. SSR, XVI (1961) 30.—*Ik.*: Krasch. op. cit. 169, fig. 7.

311 Perennial. Plants 30–70 cm high, with strongly thickened, many-branched tap root, dull green or grayish-green from rather dense pubescence of long, flexuous, simple hairs, usually on papilliform tubercles, and shorter, appressed simple hairs. Stems less numerous or solitary, always clustered at base and densely lanate-tomentose in axils of leaf sheaths, erect, dichotomously branched from middle or slightly below. Leaves dull green or grayish-green from rather dense pubescence, mixed with inconspicuous punctate-glandular hairs; basal and lower cauline leaves up to 15 cm long and 3–4 cm wide, on rather long petioles strongly thickened at base, with twice or thrice pinnately cut, oblong to oblong-linear lamina; leaf segments 3–8 on each side, quite distant, alternate lobes less distant; terminal segments broadly lanceolate to linear, up to 1.5 mm wide, with short cartilaginous cusp; middle and upper cauline leaves strongly reduced or less dissected sessile. Capitula numerous (20–50), on rather long (up to 6–8 cm) peduncle in depauperate and broadly paniculate or corymbose-paniculate inflorescence. Involucre 6–10 mm in dia, 3.0–4.5 mm long, finely grayish tomentose; involucre bracts herbaceous, outer lanceolate, fewer, lacking membranous border, inner 1.5 times, less often 2 times as long, oblong-linear, with rather narrow, light colored, membranous border. Receptacle sparsely hairy. Corolla of tubular florets 2.0–2.5 mm long. Achenes 2.0–2.5 mm long, about 0.6 mm wide, with 5–7 longitudinal ribs and about 0.1 mm long blunt-toothed corona. Flowering May to June.

Stony slopes, rocks in lower mountain zone.—*Soviet Central Asia: Mountainous Turkmenia* (Paropamisus Mountain). *General distribution*: Iran(?). Described from the Paropamisus Mountain. Type and isotype in Leningrad.

Note. So far the species is known only from the type specimens, which are without sheaths on the basal leaves and tomentum in their axils. However, there is dense tomentum in the very closely related (perhaps, even identical) Iranian species *C. platyrachis* (Boiss.) Tzvel. comb. nova [= *Pyrethrum platyrachis* Boiss. *Fl. or.* III (1875) 356], differing from *C. paropamisica* by only a slightly larger size of the capitula and the whole plant.

Series 5. Santoanae Tzvel.—Stems not tomentose at base; capitula solitary or few (up to 5 on a single stem) and then in lax corymbose-raceme; corona of achenes 0.3–0.4 mm long, irregularly aristate-toothed along margin up to middle.

15. **C. santoana** (Krasch., M. Pop. and Vved.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 370.—*Pyrethrum santoanum* Krasch. M. Pop. and Vved. in Tr. Sredneaz. Gos. Univ. Ser. VIIIc, III (1928) 102.—*Chrysanthemum santoanum* Krasch. M. Pop. and Vved. ibid. nom. altern.—Exs.: H.F.A.M. No. 476 (isotypes).

Perennial. Plants 8–30 cm high, with thickened tap root, grayish-green from rather dense pubescence of long, flexuous, simple hairs. Stems less numerous or solitary, always closely clustered, erect, simple or with few lateral branches. Leaves grayish-green from rather dense erect pubescence, with inconspicuous punctate-glandular hairs; basal and lower cauline leaves up to 5–6 cm long, 0.8 cm wide, on rather long petiole, strongly thickened at base, with pinnatisect lanceolate-linear to oblong-linear lamina; leaf segments 5–10 on each side, usually 3–5 parted, less often entire or pinnately cut; apical segments linear to oblong, up to 1.2 mm wide, with short cartilaginous cusp; middle and upper cauline leaves few, strongly reduced, sessile or sub-sessile. Capitula solitary or 2–5, on rather long peduncles, arising from axils of middle and upper cauline leaves, and then in very lax corymbs. Involucre 7–10 mm in dia, 3.5–5.5 mm long, more or less appressed hairy; involucre bracts herbaceous, outer narrow-lanceolate, lacking or more or less lacking membranous border, inner 1.5 times, less often almost 2 times as long, oblong-linear, with rather wide, light-colored, membranous border, appendiculately broadened at apex. Receptacle glabrous, very rarely hairy. Corolla of tubular florets, 1.8–2.5 mm long. Achenes 1.2–1.6 mm long, about 0.4 mm wide, with 5 longitudinal ribs and irregularly aristate-toothed (usually not deeper than middle) 0.3–0.4 mm long corona. Flowering May to June.

Stony and clayey slopes, gravel beds up to lower mountain zone.—*Soviet Central Asia*: Syr-Darya, Pamiro-Alai Region (northern and northwestern foothills). Endemic. Described from northwestern foothills of Pamiro-Alai (near village of Santo). Type in Tashkent; isotypes in Leningrad.

Section 3. Matricarioides Tzvel. sect. nova. in Addenda, XXV, 876.—Biennial or perennial(?) polycarpic 5–20 cm high plants. Capitula solitary at apices of stem and leafy branches arising from its base; involucre patelliform, 7–12 mm in dia; receptacle strongly convex, conically hemispherical, punctate-tuberculate, glabrous; corolla tube very short and wide, glabrous. Achenes 1.8–2.2 mm long, glabrous; corona 0.8–1.0 mm long, weakly truncate, irregularly obtusely lobed (lobes as many as number of ribs) almost to middle (or slightly deeper), small toothed on margin.

A monotypic section.

Note. This section is closely related through *C. santoana* to the previous section, representing, as it were, the ultimate stage of the
313 gradual ephemeralization of the mesophilic high-mountain ancestor, culminating with the formation of two desert ephemerals—species of the genus *Microcephala* Pobed. However, the relationship of this section to section *Cancrinia* also is no less close, one of whose species—*C. lasiocarpa* Winkl.—is identical with *C. discoidea*, differing from it only by having hairy achenes with a strongly elongate corona.

16. **C. discoidea** (Ldb.) Poljak. comb. nova. in litt.—*C. brachypappus* Winkl. in Tr. Peterb. Bot. Sada, XII (1892) 29.—*Pyrethrum discoideum* Ldb. Ic. pl. Fl. Ross. impr. Alt. II (1830) t. 153 and Fl. Alt. IV (1834) 119; DC. Prodr. VI, 59; Ldb. Fl. Ross. II, 556; O. and B. Fedtsch. Perech. Rast. Turk. IV, 188.—*Tanacetum ledebourii* Sch. Bip. Tanacet. (1844) 47, nom. nov. non *T. discoideum* Rchb. f. 1853.—*Matricaria songorica* Bge. in Mém. Ac. Sc. Pétersb. VII (1854) 335, nom. nov. non *M. discoidea* DC. 1837.—*M. ledebourii* (Sch. Bip.) Schischk. in Fl. Zap. Sib. XI (1949) 2733.—*Chrysanthemum discoideum* (Ldb.) B. Fedtsch. Rast. Turk. (1915) 737, non All. 1785.—*C. ledebourianum* Ling in Contr. Inst. Bot. Nat. Ac. Peiping, III (1935) 474, nom. nov.—**Ic.**: Ldb. op. cit. (1830) t. 153.

Biennial or perennial. Plants 5–20 cm high with slender tap root, more or less sparsely floccose-tomentose with long simple hairs. Stem usually branched at base, simple above, very sparsely leafy (with few strongly reduced leaves only at base), erect or ascending. Leaves grayish-tomentose to subglabrous, lacking punctate-glandular hairs; basal leaves numerous, up to 4.0–4.5 cm long and 1.5 cm wide, on

long (sometimes longer than lamina) petioles strongly thickened at base; with more or less pinnately parted oblong or ovate lamina; leaf lobes 2–5 on each side, in turn 2–5-lobed or pinnate, less often all or some entire; terminal segments ovate to broadly linear, to 1(1.5) mm wide, obtuse or subacute. Capitula solitary (but often numerous on a single plant), on long (4–16 cm long), almost leafless, erect peduncles. Involucre 7–12 mm in dia, 2–4 mm long, more or less sparsely tomentose to subglabrous; involucre bracts herbaceous, outer few, linear-lanceolate, acute, more or less lacking membranous border, inner usually not more 1.5 times as long, linear-oblong, subobtuse, with rather wide, light colored, membranous border. Corolla of tubular florets 1.2–1.8 mm long, very short and wide (its teeth usually only 1/3–1/2 as long as tube). Achenes 1.8–2.2 mm long, about 0.6 mm wide, with 5 longitudinal ribs and somewhat truncate 0.8–1.0 mm long corona, obtusely and irregularly 5-lobed up to middle or more. Flowering June to August.

Slopy, rubbly and clayey slopes up to lower mountain zone.—*Western Siberia*: Altai (southwestern part); *Soviet Central Asia*: Aralo-Caspian Region (northeastern part of Ulutau Mountains), Lake Balkhash Region, Dzhungaria-Tarbagatai. *General distribution*: Mongolia (western part), Dzhungaria-Kashgaria. Described from southwestern spurs of Altai. Type and isotypes in Leningrad.

Note. A polymorphic species, possibly comprising several ecogeographical races, differing in the degree of hairiness, shape of the leaves and structure of the involucre.

Section 4. *Cancrinia*.—Perennial, less often biennial(?) 2–10 cm high plant; capitula solitary (but many on a single plant); involucre patelliform, 10–17 mm in dia; receptacle weakly convex, glabrous, punctate-tuberculate, with inconspicuous alveolation; corolla tube rather short and wide, glabrous. Achenes 1.3–2.0 mm long, more or less sparsely hairy; corona 2.3–3.0 mm long, not truncate, divided into 8–12 linear or oblong-linear scales to or almost to base, more or less irregularly toothed along margin.

Type of section: type of genus.

Note. A few species of this section apparently are the result of secondary adaptation to severe high-mountain conditions of an ancestor of the *C. discoidea* type, which had already been subjected to significant ephemeralization. The Mongolian-Chinese, relatively low mountain species *C. lasiocarpa* Winkl. in its outward appearance (and also in many other more important characters) is still quite similar to *C. discoidea*, whereas species of the *C. chrysocephala* type are already true high-mountain perennials.

17. **C. chrysocephala** Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 125; Ldb. Fl. Ross. II, 519; O. and B. Fedtsch. Perech. Rast Turk. IV, 178.

Perennial. Plants 2–10 cm high, with slender, more or less branched rhizome, grayish from extensive tomentum of long simple hairs. Stems strongly reduced, scape-like or almost scape-like, usually caespitose together with short non-flowering shoots. Basal leaves numerous, densely grayish- or whitish-tomentose, lacking distinct punctate-glandular hairs, up to 2–3 cm long and 0.8–1.0 cm wide, on rather long (often longer than lamina), petiole strongly thickened at base, with more or less pinnately parted, oblong or ovate lamina; leaf segments (or lobes) 2–4 on each side, linear-oblong to obovate, up to 1.5(2.0) mm wide, obtuse or subobtuse, usually all or some in turn 2–4 parted or lobed; cauline leaves 1–2, strongly reduced, undivided. Capitula solitary (but usually many on a single plant), on long (2–8 cm long) erect peduncles. Involucre 10–17 mm in dia and 4–6 mm long, 315 depauperate floccose-tomentose; involucre bracts herbaceous, outer few, lanceolate and linear-lanceolate, inner 1.5 times, less often 2 times as long, oblong-linear; all bracts with wide, dark brown or brownish, membranous border, somewhat broadened at apex. Corolla of tubular florets 2.4–3.0 mm long. Achenes 1.5–2.2 mm long, about 0.6 mm wide, more or less sparsely hairy in upper part, with 5–6 longitudinal ribs and short, 2.3–3.0 mm long corona divided up to or almost to base into 8–12 linear or oblong-linear subacute, more or less irregularly toothed scales. Flowering July to August. (Plate XIII, Fig. 1.)

Rubbly and stony slopes, gravel beds above 3,000 m.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau). *General distribution*: Dzhungaria-Kashgaria. Described from Dzhungarian Alatau. Type in Leningrad.

18. **C. tianschanica** (Krasch.) Tzvel. comb. nova.—*C. chrysocephala* ssp. *tianschanica* Krasch. in Bot. Mat. Gerb. Glavn. Bot. Sada, II (1922) 81.

Perennial. Plants 2–10 cm high, with slender, more or less branched rhizome, grayish from extensive lax tomentum of long simple hairs. Stems strongly reduced, scape-like or almost scape-like, caespitose with short nonflowering shoots. Leaves like previous species. Capitula solitary (but many on a single plant), on long erect peduncles. Involucre 10–17 mm in dia, 4–6 mm long, extensively lax floccose-tomentose; involucre bracts like previous species, but with somewhat narrower, light brown, membranous border. Corolla of tubular florets 2.4–3.0 mm long. Achenes 1.5–2.2 mm long, about 0.6 mm wide, sparsely hairy throughout, with 5–6 longitudinal ribs and 2.3–3.0 mm long

corona, divided to or almost to base into 8–12 linear or oblong-linear scales. Flowering July to August.

Rubbly and stony slopes above 3,000 m.—*Soviet Central Asia*: Tien Shan (central part). *General distribution*: Dzhungaria-Kashgaria (Tien Shan). Described from central Tien Shan. Type and isotype in Leningrad.

Note. The discrete range and the absence of transitional forms with regard to the achene pubescence provide a basis to consider this subspecies described by Krascheninnikov as a separate species.

GENUS 1537. *Lepidolopsis* Poljak.^{1,2}

Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 374.—*Crossostephium* auct. non Less.: Rgl. and Schmalh. in Izv. Obshch. Lyubit. Estestv. Antrop. Etnogr. XXXIV, 2 44 p. p.

Capitula numerous (more than 50), on up to 0.8 cm long peduncles, in compact spicate-panicles, homogamous, with large number (25–50) of bisexual, tubular disk florets. Involucre goblet-shaped, obconical at base, 4–6 mm in dia, 3–4 mm long; involucre bracts coriaceous-herbaceous, imbricate, in 4 irregular rows, outer broadly lanceolate, usually lacking membranous border, inner lanceolate-oblong, 2–2.5 times as long, with appendiculately broadened light colored membranous border at apex. Receptacle weakly convex, short- and obtusely conical, glabrous, punctate-tuberculate, with inconspicuous alveolation and abundant resin secretion, solid. Corolla of tubular disk florets yellow, 1.7–2.0 mm long, with short and wide tube slightly and gradually broadening in upper part, with 5 (less often 4–6) subobtuse, erect, deltoid teeth, a sixth to a fifth as long as tube. Filaments thickened in upper part; anthers lacking basal appendage, with vate or oblong ovate subobtuse apical appendage; pollen grains roundish, spiny. Style bifid; branches linear, truncate. All achenes similar, glabrous, 1.0–1.6 mm long, prismatic, gradually narrowed toward base, with 5 prominent longitudinal ribs; pappus as corona, 0.3–1.0 mm long, divided almost to base, into 8–12 oblong unequal lobes, ventrally divided up to or almost to base, unilateral. Perennial herbs; covered with long and short simple hairs, usually subglabrous with thick oblique rhizome, erect stem and alternate leaves with 2–3-pinnatisect lamina.

A monotypic genus.

Note. P.P. Poljakov, who described this genus, included in it a whole series of species of different affinity. I have referred some of them (species with homogamous capitula) to the genus *Cancrinia* Kar.

¹Treatment by N.N. Tzvelev.

²From Greek words: *lepis*—scale, and *lopsi*—not precisely translatable; named for the pappus of the achene, which is divided into scaly lobes.

and Kir. and some (species with heterogamous capitula) to the genus *Tanacetum* L. However, *Lepidolopsis turkestanica* (Rgl. and Schmalh.) Poljak., being the type species of the new genus, differs from other species by its unique inflorescence, very similar to the inflorescence of many worm-woods, as well as by a series of less important characters, so that the generic name "*Lepidolopsis*" can be retained for it. On the basis of the form of the inflorescence and the structure of the achenes, *Lepidolopsis* is very close to the genus *Crossostephium* Less. but the only species of the latter, *C. sinense* (L.) Makino, distributed in China and Japan, is a grayish tomentose half-shrub with heterogamous capitula and almost equal involucre bracts.

1. ***L. turkestanica*** (Rgl. and Schmalh.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 375.—*Crossostephium turkestanicum* Rgl. and Schmalh. in Izv. Obshch. Lyub. Estestv., Antrop. i E'tnogr. XXXIV, 2 (1882) 44; O. and B. Fedtsch. Perech. Rast. Turk. IV, 203.—*Tanacetum johnstonii* Hemsl. in Journ. of Bot. XXI (1883) 135.—*T. turkestanicum* (Rgl. and Schmalh.) Poljak. 1. c. XV
317 (1953) 382.—*Artemisia turkestanica* (Rgl. and Schmalh.) Franch. in Ann. Sc. Nat. Ser. 6, XVI (1883) 311.—*A. chrysostachya* Rech. f. and Köie, Symb. afghan. II (1955) 52.—*Pyrethrum johnstonii* (Hemsl.) Buser in Boiss. Fl. or. Suppl. (1888) 299.—*Chrysanthemum chrysostachys* (Rech. f. and Köie) Kitam. in Acta Phyt. et Geobot. XVI (1957) 34.—**lc.**: Rech. f. and Koie, op. cit. fig. 41.

Perennial. Plants 40–100 cm high, with thick oblique rhizome, usually lacking short nonflowering shoots, usually covered with long erect and short, papilliform, simple hairs to more or less glabrous. Stems solitary or few, erect, extensively leafy, usually branched only in inflorescence. Leaves sparsely hairy to more or less glabrous with few distinct punctate-glandular hairs; basal (withering early) and lower cauline leaves up to 10–15 cm long and 3.5 cm wide, with petioles thickened at base, usually with short lateral segments almost up to base, lamina broadly linear or oblong, twice or thrice pinnately cut; apical segments lanceolate or lanceolate linear, somewhat thick, up to 1 mm wide, with short cartilaginous cusp; upper cauline leaves with more or less reduced lamina, sessile. Capitula numerous, in compressed spicate panicle; arising from axils of strongly reduced apical leaves in clusters of 1–10 on very short (up to 0.8 mm long) slender peduncles. Involucre 4–6 mm in dia, 3–4 mm long, glabrous or subglabrous, usually with golden tinge. Corolla of tubular florets yellow, 1.7–2.0 mm long. Achenes 1.0–1.6 mm long and 0.3–0.5 mm wide; corona divided almost to base on ventral side into 8–12 longitudinal lobes, 0.3–1.0 mm long. Flowering June to August. (Plate XII, Fig. 2.)

Stony slopes, steppes; up to lower mountain zone.—*Soviet Central Asia*: Tien Shan (western part), Syr-Darya Amu-Darya, Pamiro-Alai Region (excluding Pamir). *General distribution*: Iran-Afghanistan (Afghanistan). Described from western Tien Shan. Lectotype (Chirchik River valley near village of Pakrak, VIII, 1876, A. Regel) and isotype in Leningrad.

GENUS 1538. **Tanacetum** L. Emend. Tzvel.^{1,2}

L. Sp. pl. (1753) 843 p. p. and Gen. pl. ed. 5 (1754) 366.

Capitula more or less numerous (2–80), in lax or dense corymbs, less often solitary, always heterogamous, with outer pistillate florets tubular or Ligulate, 1–30 in one row, and much more numerous, bisexual, tubular disk florets. Involucre goblet-shaped, 3.5–18.0 mm in dia and 3–8 mm long; involucre bracts coriaceous-herbaceous or
 318 herbaceous, imbricate, in 3–5 irregular rows, more or less scarious on margin or entirely lacking border; outer bracts lanceolate to broadly ovate, inner lanceolate-linear to linear-oblong, 1.5–3 times as long. Receptacle strongly or weakly convex, less often (section *Asterotricha*) almost flat, solid, glabrous, weakly punctate-tuberculate. Corolla of ligulate florets (if present) yellow, with dorsally compressed but wingless or almost winged tube 1.2–2.5 mm long and limb of various shapes (from reniform trilobate to oval-oblong with 2–3 more or less distinct teeth at apex) up to 11 mm long, ligulate florets usually gradually changing over to pistillate tubular florets, in many respects similar to bisexual tubular disk florets, but with strongly reduced stamens and slightly smaller, more or less dorsally compressed corolla with 2–5 teeth (sometimes differing in shape and size); corolla of bisexual tubular disk florets yellow, 1.5–3.5 mm long, with relatively short tube, usually gradually but slightly broadening in upper half, with 5 erect or weakly deflexed deltoid or lanceolate-deltoid teeth, 2/11–1/3 as long as tube. Filaments thickened in upper part; anthers lacking distinct basal appendage, with lanceolate-ovate subobtus apical appendage; pollen grains roundish spiny. Styles bifid; style branches linear, truncate. All achenes similar, glabrous, more or less prismatic-terete, narrowed towards base, 1.2–3.5 mm long, 0.5–0.9 mm wide; with 5–10 (very rarely up to 15) more or less prominent longitudinal

¹Treatment by N.N. Tzvelev.

²From the Latin word: *tanaceta* or *tanazita*—the medieval name of a plant of unknown origin, probably, belonging to *Tanacetum vulgare* L.

ribs, scales more compactly appressed to kernel, lacking mucilaginous cells and secretory canals; pappus 0.1–0.7 mm long, as corona more or less toothed or lobed along margin, sometimes divided almost to base. Perennial herbs (very rarely more or less woody at base), usually less covered with simple, bifid or stellate hairs, with erect or basally ascending stem, and alternate leaves with more or less pinnately divided, very rarely (in *T. akinfiievii*) pinnately lobed lamina.

More than 50 species distributed in almost all nontropical countries of the Northern Hemisphere. Of these, 34 species are found in the USSR.

Type of genus: *Tanacetum vulgare* L.

Note. The border between this and the extremely close genus *Pyrethrum* Zinn has always been very undefined; consequently, these genera have usually been separated either on the basis of the presence or absence of ligulate florets, or on the basis of the peculiar arrangement and number of the capitula. Neither of these characters holds up to serious criticism, and not without basis, therefore, many authors in recent times, while maintaining the separate generic status of *Chrysanthemum* L. and *Leucanthemum* Mill., have combined *Tanacetum* and *Pyrethrum* into the single genus *Tanacetum*, as was done even by 319 K.H. Schultz (Bi-pontinus, *Über die Tanaceteen*, 1844). However, here I have retained *Pyrethrum* as a separate genus, mainly on the basis of the different color of the ligulate florets in *Tanacetum* species. This division is not just a formal one, as it initially appears, but is fully justified. Actually, all species of *Pyrethrum* (in the circumscription accepted here) have white or pink outer ligulate florets, usually with long ligules, that are missing only in the two cultivated species, so that the capitula become homogamous. In *Tanacetum* species, the ligulate florets are yellow, almost always with strongly reduced ligules, forming not homogamous but heterogamous capitula with pistillate tubular florets as a result of gradual reduction. Based on this, the genus *Cancrinia* Kar. and Kir. (in the circumscription accepted here), not the genus *Tanacetum*, should be considered the closest to *Pyrethrum*. There is even a basis to suppose that *Pyrethrum* may have given rise to *Cancrinia* with its homogamous capitula by the complete reduction of its white or pink florets, and that *Tanacetum* species then evolved from species of the *Cancrinia* type by modification of the outer bisexual tubular florets into pistillate ones subsequently modified secondarily into yellow ligulate florets. From this standpoint, in the genus *Tanacetum* the species with ligulate florets are more recent than the species having only tubular florets, which also is usually confirmed by an analysis of other characters.

The genus is divided into four natural sections, which undoubtedly are related but are so isolated that they could easily be treated as separate genera.

1. Entire plant grayish from dense pubescence of stellate hairs; receptacle almost flat. (sect. *Asterotricha*.) 2.
- + Plant, more or less covered with bifid or simple hairs; sometimes subglabrous; receptacle strongly or weakly convex 3.
2. Involucre 3.5–6 mm in dia; ligulate florets 2–8, ligule 1.5–2.5 mm long 33. **T. turcomanicum** (Krasch.) Tzvel.
- + Involucre 6–10 mm in dia; ligulate florets 8–16, ligule 3–3.5 mm long 34. **T. Walteri** (Winkl.) Tzvel.
3. Plants 30–150 cm high, with densely leafy stem, almost always lacking short nonflowering shoots; achenes 1.2–2.5 mm long. (sect. *Tanacetum*.) 4.
- + Plants up to 40 (60) cm high, with relatively sparsely leafy stem, but always with short nonflowering shoots (as rosettes of basal leaves); achenes 1.5–3.5 mm long 7.
4. Leaves pinnately parted or pinnately cut, with pinnately lobed, less often pinnately parted segments; pubescence mainly of simple hairs. Widely distributed species 5.
- + Leaves twice or thrice pinnately cut; pubescence mainly of bifid hairs 6.
5. Involucre 7–13 mm in dia; involucre bracts with wider dark brown membranous border 3. **T. boreale** Fisch. ex DC.
- + Involucre 5–8 mm in dia; involucre bracts with narrower light colored or brownish border 2. **T. vulgare** L.
6. Leaves thrice pinnately cut into narrow-linear and linear-lanceolate segments. Transcaucasia 5. **T. abrotanifolium** (L.) Druce.
- + Leaves twice pinnately cut into linear and oblong, often irregularly lobed or toothed segments. Soviet Central Asia 4. **T. pseudoachillea** Winkl.
7. Pubescence of long simple hairs extensive. Arctic plants. (sect. *Omalotes*.) 1. **T. bipinnatum** (L.) Sch. Bip.
- + Pubescence lax or dense but always of shorter bifid (often mixed with simple) hairs. Plants of steppe and semidesert zone. (sect. *Xanthoglossa*.) 8.
8. Capitula lacking ligulate florets or with indistinctly ligulate (often bilabiate) florets, slightly exceeding tubular florets; ligules, if present, not more than 1.0 (1.5) mm long 9.
- + Capitula always with ligulate florets, distinctly longer than tubular florets, ligules more than (1.5)2.0 mm long 24.
9. Stem strongly branched only near more or less woody base, caespitose, very sparsely leafy, more or less virgate; capitula solitary (but numerous on a single plant), 5–9 mm in dia, at apices. Southern Transcaucasia 10.

- + Stem herbaceous, usually branched above base; capitula few (sometimes numerous), very rarely (in very weak specimens) capitula solitary on stems 11.
- 10. Outer involucre bracts lanceolate-ovate, subobtusate, with wide membranous border 30. **T. tenuissimum** (Trautv.) Grossh.
- + Outer involucre bracts lanceolate from ovate base, acuminate, almost lacking membranous border 10. **T. tabrisianum** (Boiss.) Sosn. and Takht.
- 11. Outer involucre bracts broadly ovate to lanceolate-ovate, with rather wide membranous border (degenerating on drying) 12.
- 321 + Outer involucre bracts lanceolate, acute or subacute, with or without narrow membranous border 15.
- 12. Plants usually densely grayish-pubescent, from saline steppes and semideserts; involucre 4–7 (8) mm in dia 13.
- + Green or dull green, more weakly pubescent plants, from rubbly and stony steppes and slopes; involucre 5–11 mm in dia 14.
- 13. Involucre usually pubescent only near base; outer involucre bracts broadly ovate; with wide membranous border 26. **T. achilleifolium** (MB.) Sch. Bip.
- + Involucre pubescent at base and on dorsal side of bracts; outer involucre bracts lanceolate-ovate, with narrower membranous border 17. **T. santolina** Winkl.
- 14. Capitula (2)5–15(20) on a single stem, in more or less regular and relatively dense, corymbs. Crimea 24. **T. paczoskii** (Zefir.) Tzvel.
- + Capitula solitary or 2–5 on a single stem, in depauperate, usually irregular corymbs. Ulutau Mountains 25. **T. ulutavicum** Tzvel.
- 15. Capitula in regular and rather dense corymbs; peduncles up to 8–10(15) mm long 16.
- + Capitula in lax, usually irregular corymbs; peduncles 1–15 (20) cm long. Kazakhstan 21.
- 16. Receptacle rather strongly convex. Altai, Tarbagatai, Saur, Dzhungaria Alatau 17.
- + Receptacle weakly convex, sometimes almost flat. Transcaucasia, Kopetdag 18.
- 17. Capitula (6)8–10(12) mm in dia, on strongly thickened peduncles in very dense, almost capitate corymbs 13. **T. crassipes** (Stschegl.) Tzvel.
- + Capitula (5)6–8(10) mm in dia, on relatively thin peduncles in less dense corymbs 12. **T. tanacetoides** (DC.) Tzvel.
- 18. Capitula (2)4–10(15), at stem apices, in very dense, almost capitate corymbs 11. **T. canescens** DC.

- + Capitula in depauperate corymbs, usually more numerous 19.
- 19. Capitula 2.0–3.5 mm in dia, (10)20–60(80) on single stem; peduncles relatively slender, covered with fine appressed tomentum 6. **T. myriophyllum** Willd.
- + Capitula 3.5–6.5 mm in dia, (1)5–15(45) on single stem; peduncles thicker, extensively covered with lax tomentum 20.
- 322 20. Capitula 3.5–5.5 mm in dia, (5)10–35(45) on single stem. Talysh 7. **T. duderanum** (Boiss.) Tzvel.
- + Capitula 5.0–6.5 mm in dia. (1)5–15(20) on single stem. Kopetdag 8. **T. heterophyllum** Boiss.
- 21. Involucre 4–7 mm in dia; outer involucre bracts usually with more or less distinct membranous border. Plants of solonchik steppes and semi-deserts 17. **T. santolina** Winkl.
- + Involucre (5)7–10(12) mm in dia; outer involucre bracts usually lacking membranous border. Plants of rubbly and stony slopes, rocks 22.
- 22. Leaves twice pinnately cut, usually grayish from dense pubescence 14. **T. turlanicum** (Pavl.) Tzvel.
- + Leaves pinnately cut, with more or less pinnately lobed segments, usually green or dull green, weakly pubescent, more hirsute than in previous species 23.
- 23. Segments of leaves more approximate, with acuminate lobes; peduncles of capitula usually longer, 2–20 cm long. Karakala Mountains 15. **T. scopulorum** (Krasch.) Tzvel.
- + Segments of leaves more distant, with acute lobes; peduncles of capitula usually shorter, 1–8 cm long. Mugodzhary Mountains ... 16. **T. saxicolum** (Krasch.) Tzvel.
- 24. Lamina broadly linear, uniformly pinnately lobed or crenate. Dagestan 32. **T. akinievii** (Alex.) Tzvel.
- + Leaves with pinnately cut or parted lamina 25.
- 25. Outer involucre bracts more or less lanceolate, acute or subacute, with or without very narrow membranous border 26.
- + Outer involucre bracts ovate or lanceolate-ovate; obtuse or subobtuse, with rather wide (but easily degenerating) membranous border 30.
- 26. Lamina pinnatisect, with undivided or partly irregularly pinnately lobed (less often divided) segments. Caucasus 9. **T. tamrutense** (Sosn.) Sosn.
- + Lamina twice pinnately cut 27.
- 27. Plants green, weakly pubescent 28.
- + Plants more or less grayish from dense pubescence 29.
- 28. Lamina up to 3 cm wide; corona of achene 0.2–0.4 mm long 20. **T. uralense** (Krasch.) Tzvel.

- + Lamina up to 2 cm wide, on the average less dissected and thicker; corona of achenes 0.4–0.7 mm long 21. **T. sclerophyllum** (Krasch.) Tzvel.
- 323 29. Involucre (5)7–10(12) mm in dia; plants short, to 35 cm high 19. **T. kittaryanum** (C.A.M.) Tzvel.
- + Involucre (8)10–12(15) mm in dia; plants taller, to 60 cm high..... 18. **T. karelinii** Tzvel.
- 30. Capitula solitary, very rarely 2 on a single stem; involucre 8–12 mm in dia; corolla tube of tubular florets rather abruptly and strongly broadened in upper half; achenes 2.6–3.5 mm long. Transcaucasia 31. **T. uniflorum** (F. and M.) Sch. Bip.
- + Capitula usually rather numerous, less often (in weak specimens) solitary; corolla tube of tubular florets gradually but slightly broadened in upper half; achenes 1.5–2.8 mm long 31.
- 31. Leaves grayish from extensive pubescence; terminal segments and lobes roundish at apex, obtuse, or with very short cusp. Transcaucasia 32.
- + Leaves grayish or green; terminal segments more or less acuminate. Other regions of the USSR 34.
- 32. Capitula solitary or 2–3 on a single stem, on rather long peduncles (up to 6–10 cm); involucre 7–9 mm in dia 29. **T. oligocephalum** (DC.) Sch. Bip.
- + Capitula (3)5–10(15), very rarely (in very weak plants) solitary, and then involucre less than 7 mm in dia 33.
- 33. Capitula on up to 5–6 cm long peduncles, in rather dense corymbs 27. **T. chiliophyllum** (F. and M.) Sch. Bip.
- + Capitula on up to 12 cm long peduncles, usually arcuately divergent from stem axis, in quite lax but regular corymbs 28. **T. longipedunculatum** (Sosn.) Tzvel.
- 34. Leaves green, weakly pubescent (to completely glabrous); involucre 5–9 mm in dia; ligulate florets with ligule 1–2 mm long. Crimea 24. **T. paczoskii** (Zefir.) Tzvel.
- + Leaves more or less grayish from rather dense pubescence 35.
- 35. Involucre 4–7 mm in dia; ligules 1–2 mm long; lamina of basal leaves linear, to 1.3(1.5) cm wide. Plants of solonetzic steppes and solonetztes 26. **T. achilleifolium** (MB.) Sch. Bip.
- + Involucre 7–12 mm in dia; ligules 1.8–3 mm long; lamina of basal leaves oblong-linear, to 2 cm wide. Plants of rubbly and stony steppes and slopes 36.
- 36. Stem and leaves extensively pubescent with semi-erect hairs; capitula in dense corymb on up to 2 (4) cm long peduncles 22. **T. odessanum** (Klok.) Tzvel.

- 324 + Stem and leaves appressed (and relatively weakly) hairy; capitula in more lax corymb on up to 5(8) cm long peduncles
 23. **T. millefolium** (L.) Tzvel.

Section 1. *Omalotes* (DC.) Tzvel. comb. nova.—*Omalanthus* Less. Syn. comp. (1832) 260, non Juss. 1824.—*Omalotes* DC. Prodr. VI (1837) 83.—Plants 6–50 cm high, more or less villous, with short nonflowering shoots and leafy stems, mainly in lower half. Capitula solitary or more numerous, and then aggregated in corymb, with or without ligulate florets. Involucre broadly cupuliform, 10–18 mm in dia; outer involucre bracts two-thirds, less often a half, as long as inner; receptacle strongly convex, slightly punctate-tuberculate, weakly alveolate. Achenes 2.4–3.5 mm long, with 5–7 prominent longitudinal veins and undivided, corona more or less irregularly toothed, 0.3–0.8 mm long.

Type of section: *Tanacetum camphoratum* Less.

Note. Of the three closely related species in this section, the most “primitive” species on the basis of all characters, *T. camphoratum* Less., with numerous large capitula lacking ligulate florets and arranged in dense corymbs, is found in California; the second species, *T. huronense* Nutt., with very short ligulate florets, is distributed mainly in Canada, and the third, relatively “recent” species, *T. bipinnatum* (L.) Sch. Bip., with rather large ligulate florets and usually solitary capitula, is a widely distributed arctic plant.

1. **T. bipinnatum** (L.) Sch. Bip. Tanacet. (1844) 48, non Druce, 1914.—*T. kotzebuense* (Bess.) Bess. in Bull. Soc. Nat. Mosc. IX (1836) 107; DC. Prodr. VI, 131.—*Chrysanthemum bipinnatum* L. Sp. pl. (1753) 890.—*Matricaria bipinnata* (L.) Desr. in Lam. Encycl. meth. III (1792) 736.—*Pyrethrum bipinnatum* (L.) Willd. Sp. pl. III (1803) 2160; DC. op. cit. 60; Ldb. Fl. Ross. II, 557; Kryl. Fl. Zap. Sib. XI, 2751.—*P. velutinum* Fisch. ex Trautv. in Tr. Peterb. Bot. Sada, VIII, 2 (1883) 457.—*Artemisia kotzebuensis* Bess. in Nouv. Mem. Soc. Nat. Mosc. III (1834) 80.—**Ice.**: Gmel. Fl. sib. II (1749) t. 85, fig. 1; Rouy, Ill. Pl. Eur. rar. XIV (1900) t. 339.—**Exs.**: GRF No. 3271.

Perennial. Plants 6–40 cm high, with creeping, more or less branched rhizome, bearing short nonflowering shoots and stems. Stems solitary or few, erect or ascending at base, leafy mainly below, simple or with few lateral branches above. Leaves grayish-green or dull green from more or less extensive pubescence of long flexuous simple hairs, sometimes subglabrous, with inconspicuous punctate-glandular hairs or lacking them; basal and lower cauline leaves 25–30 cm long, on rather long petiole, with twice or thrice pinnately cut oblong to linear-

oblong lamina; terminal segments of leaves ovate to linear, acute; middle and upper cauline leaves sessile or sub-sessile, like basal, but smaller and less dissected. Capitula solitary, less often 2–4 on single stem, on long, more or less apically thickened peduncles. Involucre 10–18 mm in dia, 4–8 mm long, usually more or less lanate; involucre bracts herbaceous, with wide, brown or blackish-brown, membranous border, outer broadly lanceolate, inner 1.5–2 times as long, lanceolate-oblong. Ligulate florets 15–30, yellow, corolla tube 2.0–2.5 mm long, and ligules 3–7 mm long, oblong to almost rotund; corolla of tubular florets 2.5–3.0 mm long. Achenes 2.5–3.5 mm long and about 0.7–0.9 mm wide, corona 0.3–0.8 mm long. Flowering July to August.

Sandy and gravelly riverbanks, stony slopes.—*Arctic*: Arctic Europe, Arctic Siberia, Chukotka, Anadyr; *European part*: Karelia-Lapland (northeastern part), Dvina-Pechora (northern part); *Western Siberia*: Ob River Area (northern part); *Eastern Siberia*: Yenisei (northern part), Lena-Kolyma (in the south up to Vilyui River valley); *Far East*: Okhotsk. *General distribution*: Alaska, Canada (northwestern part). Described from Siberia. The Gmelin illustration cited above is the type.

Note. Very variable in pubescence and the nature of the leaf division, but apparently does not form any distinct ecogeographical races. Distributed very sporadically within the limits of its range.

Section 2. *Tanacetum*.—*Tanacetum* sect. *Eutanacetum* DC. Prodr. VI (1837) 128.—*Gymnocline* sect. *Anactis* C. Koch in Linnaea XXIV (1851) 340.—*Pyrethrum* sect. *Tanacetum* (L.) Boiss. Fl. or. III (1875) 351 p. p.—*P.* sect. *Tanacetum* subsect. *Eutanacetum* (DC.) Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 51.—*Chrysanthemum* sect. *Tanacetum* (L.) Hoffm. in Pflanzenfam. IV, 5 (1889) 278, p. p.—*C.* sect. *Eutanacetum* (DC.) Kitam. Compos. Japon. II (1940) 341.—Plants weakly pubescent (from short simple and bifid hairs), 30–150 cm high, usually lacking short non-flowering shoots, with densely leafy stems. Capitula (3)8–80(100), at apex of main stem in rather dense corymbs lacking ligulate florets. Involucre cupuliform, 4–13 mm in dia; outer involucre bracts a half to two-thirds as long as inner. Receptacle weakly convex, punctate-tuberculate. Achenes 1.2–2.5 mm long, with 5–7 (less often to 8) prominent longitudinal ribs and undivided corona 0.1–0.4 mm long, more or less irregularly toothed.

Type of section: Type of genus.

Note. A small section including, besides the four species described below, apparently a few Mediterranean and Northwest Asia species, e.g., the Iranian species *T. budjnurdense* (Rech. f.) Tzvel. comb. nova 326 (= *Chrysanthemum budjnurdense* Rech. f. in Oesterr. Bot. Zeitschr. XLVII (1950) 231), which is close to *T. abrotanifolium*.

Series 1. *Vulgaria* Tzvel.—Leaves pinnately parted or cut, with pinnately lobed, less often pinnately parted segments; pubescence mainly of simple hairs.

2. ***T. vulgare*** L. Sp. pl. (1753) 845; MB. Fl. taur.-cauc. II, 289; DC. Prodr. VI, 128; Ldb. Fl. Ross. II, 601; Turcz. Fl. baic.-dahur. II, 74, p. p.; O. and B. Fedtsch. Perech. Rast. Turk. IV, 205; Grossh. Opred. Rast. Kavk. 462; Kryl. Fl. Zap. Sib. XI, 2756.—*T. umbellatum* Gilib. Fl. lithuan. I (1781) 171.—*T. vulgare* var. *genuinum* Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 1 (1866) 144; B. Fedtsch. Rast. Turk., (1915) 738.—*C. tanacetum* Vis. Fl. Dalm. II (1847) 84; Schmalh. Fl. II, 70.—*Pyrethrum vulgare* (L.) Boiss. Fl. or. III (1875) 352; Sosn. in Tr. Tifi. Bot. Sada, XVII, 53; Grossh. Fl. Kavk. IV, 130.—**Ic.**: Rchb. Ic. Fl. Germ. XVI (1854) t. 996; Majeovsky, Fl. Sr. Ross. (1892) Fig. 46; Syreistsch. Ill. Fl. Mosk. Gub. III, 267; B. Fedtsch. and Fler, Fl. Evr. Ross. III, 976, Fig. 977; Monteverde, Bot. Alt., Plate 37, Fig. 5; Bonnier, Fl. Compl. France, Suisse et Belg. V, t. 292; Hegi, Ill. Fl. VI, 2, t. 263, fig. 5 and Fig. 332; Perfilev, Fl. Ser. Kr. 353, Fig. 104; Zemlinsky, Lekarstv. Rast. SSSR, ed. 2, 210; Mikhailovskaya, in Fl. Beloruss. V (1959) Plate 33.—**Exs.**: Fl. Stir. exs. No. 794; Fl. Pol. exs. No. 535; Pl. Pol. exs. No. 275; Pl. Finl. exs. No. 977 and 1387; Pl. Belg. exs. No. 197; GRF No. 974 and 974a.

Perennial. Plants 30–150 cm high, with creeping, more or less branched rhizome. Stems solitary or rather numerous, erect, extensively leafy, usually more or less branched only at apex. Leaves sparsely hairy (to glabrous), with short simple hairs, sometimes modified into bifid, with numerous punctate-glandular hairs; basal leaves withering early; cauline leaves to 20 cm long and 8–10 cm wide, lower on rather long petiole thickened at base, upper sessile or subsessile; lamina oblong or oblong-ovate, pinnately parted or cut up to narrow-winged axis, with pinnately lobed, less often pinnately parted segments; terminal segments or lobes ovate to linear-lanceolate, usually up to 5 mm wide, more or less toothed or entire, short acuminate. Capitula (5)10–70(100), in fairly dense, compound corymbs. Involucre 5–8 mm in dia, 4–6 mm long, more or less hairy to subglabrous; involucre bracts herbaceous, with rather narrow (but more or less broadening at apex), light colored or brownish, membranous border, outer ovate-lanceolate, inner oblong-lanceolate. Corolla of tubular florets 1.5–2.4 mm long, slightly smaller in outer pistillate florets. Achenes 1.2–1.8 mm long and about 0.5 mm wide, corona 0.2–0.4 mm long. Flowering July to October.

Meadows, scrubs, steppes, riverbanks, thinned forests, as a weed of roadsides, along borders of fields, and old fields, up to middle mountain zone.—*Arctic*: (rarely, as introduced plant); *European part*:

(All regions); *Siberia*: (All regions); *Far East*: (Mainly as introduced plant); *Caucasus*: Ciscaucasia, Dagestan, Transcaucasia (rarely); *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan (central part) introduced into other districts. *General distribution*: Western Europe, Turkey, China (northern part), Mongolia, Korea, Japan (northern part), North America (mainly as introduced plant), introduced into other countries. Described from Western Europe. Type in London.

Note. Known already to Linnaeus, *T. vulgare* var. *crispum* Ldb. (*Fl. Ross.* II, 601), with crimped leaves, was developed under cultivation and has been spread through botanical gardens, now and then becoming a naturalized garden variety of this species.

Economic Importance. It is a medicinal plant, long used in folk medicine. Its stems and capitula contain an insecticidal substance. A detailed account of its medicinal importance can be found in S.E. Zemlinsky's book (pp. 209–211) cited above.

3. **T. boreale** Fisch. ex DC. Prodr. VI, (1837) 128; Ldb. *Fl. Ross.* II, 602; O. and B. Fedtsch. *Perech. Rast. Turk.* IV, 205.—*T. vulgare* auct. non L.: Turcz. *Fl. baic.-dahur.* II (1845) 74 p. p.—*T. vulgare* var. *boreale* (Fisch. ex DC.) Trautv. and Mey. *Fl. ochot.* (1856) 54; Kryl. *Fl. Zap. Sib.* XI, 2757.—*Chrysanthemum boreale* (Fisch. ex DC.) B. Fedtsch. *Rast. Turk.* (1915) 738, non Makino 1909.—*C. vulgare* var. *boreale* (Fisch. ex DC.) Makino in Makino and Nemoto, *Fl. Jap.* (1925) 43.—**lc.**: Gmel. *Fl. Sib.* II (1749) t. 65, fig. 1.

Perennial. Plants 30–100 cm high, with creeping, more or less branched rhizome; stems solitary or few, erect, usually branched only at apex. Leaves like previous species, but on the average more hairy; terminal lobes of pinnately parted segments usually more distant and narrower, with longer cusp. Capitula (3)5–40(50), in dense, compound corymbs. Involucre 7–13 mm in dia and 5–7 mm long, more or less hairy to subglabrous; involucre bracts like previous species, but with wider dark brown membranous border. Corolla of tubular florets 2–3 mm long, less often modified into ligulate in outer pistillate florets, usually smaller. Achenes 1.5–2.0 mm long, about 0.6 mm wide, corona 0.1–0.3 mm long. Flowering July to September.

Meadows, banks of lakes and rivers, herb slopes, scrubs, by roadsides (in southern regions in middle and upper mountain zones).—*Arctic*: Arctic Europe(?), Arctic Siberia, Chukotka, Anadyr; *Western Siberia*: Ob River Area (northern part), Altai; *Eastern Siberia*: Yenisei (northern part), Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: (All regions); *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan (central part). *General distribution*: China (northern part), Mongolia,

Korea, Japan (northern part), Alaska, Canada. Described from garden specimens, apparently coming from Far East. Type in Berlin; isotypes (?) in Leningrad.

Note. This species is connected to *T. vulgare* by fairly numerous intermediate forms and differs from it not so much in the degree of division of the leaves (individuals of *T. vulgare* with strongly divided, twice pinnatifid leaves are found almost throughout its range) as in larger and fewer capitula and involucre bracts with a broader, dark brown membranous border. I have not seen completely authentic specimens of *T. boreale* from the European Part of the USSR, and the available reports refer, apparently, to specimens of *T. vulgare* with more divided leaves.

Series 2. Pseudoachillea Tzvel.—Leaves pinnately cut, with pinnately parted or cut segments; hairs mainly bifid.

4. ***T. pseudoachillea*** Winkl. in Tr. Peterb. Bot. Sada, XI, 12 (1891) 373; O. and B. Fedtsch. Perech. Rast. Turk. IV, 205.—*T. newesskyanum* Winkl. l. c. 374; O. and B. Fedtsch. ibid. 205.—*Chrysanthemum pseudoachillea* (Winkl.) B. Fedtsch. Rast. Turk. (1915) 738.—*C. newesskyanum* (Winkl.) B. Fedtsch. ibid. 738.—*Lepidolopsis pseudoachillea* (Winkl.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 375.—*Pyrethrum pseudoachillea* (Winkl.) Bornm. Pl. Turkest. No. 565.—Exs.: Bornmuller, Pl. Turkest. No. 565; GRF No. 3274.

Perennial. Plants 30–120 cm high, with creeping, more or less branched rhizome; stems solitary or few, erect, extensively leafy, usually more or less branched only at apex. Leaves sparsely hairy (to subglabrous) with short bifid hairs, partly simple, and very short papilliform hairs, as also numerous but not always punctate-glandular hairs; basal leaves withering early; cauline leaves to 20 cm long and 8 cm wide, lower on rather long petiole, upper sessile or subsessile; their lamina oblong, pinnatisect to very narrow-winged axis, with pinnately parted or cut segments; lobes shallow-lobate or irregularly toothed acuminate. Capitula (10)15–60(80), in rather dense, compound, corymb. Involucre 4–6 mm in dia, 3.5–4 mm long, glabrous or subglabrous. Involucre bracts coriaceous-herbaceous, outer lanceolate, almost lacking membranous border, inner linear-oblong, with narrow, appendiculately broadened at apex, light colored or brownish, membranous border. Corolla of tubular florets 1.5–2.5 mm long, usually smaller in few outer pistillate florets. Achenes 1.8–2.5 mm long and about 0.6–0.8 mm wide, corona 0.2–0.4 mm long. Flowering June to August.

Stony slopes, meadows, forest glades, juniper forests; up to upper mountain zone.—*Soviet Central Asia*: Tien Shan (western part), Pamiro-Alai (with the exception of Pamir). *General distribution*: Afghanistan(?). Described from western Tien Shan (Chirchik River Valley). Lectotype (*Am Fusse d. Berges Tschingan am d. Ufer d. Tschirschik*, 20. VI-2. VII, 1881, A. Regel) and isotype in Leningrad.

Note. Probably by mistakes, this species, extremely close to *T. vulgare*, was included by P.P. Poljakov (op. cit.) in the genus *Lepidolopsis* Poljak. *Tanacetum newesskyanum* Winkl., which differs from *T. pseudoachillea* by having broader leaf lobes and larger capitula, apparently was described from a shade form of *T. pseudoachillea*.

Series 3. *Abrotanifolia* Tzvel.—Leaves thrice pinnately cut, with linear terminal lobes; hairs mainly bifid.

5. ***T. abrotanifolium* (L.) Druce** in Rep. Bot. Exch. Cl. Brit. Isl. 1913, III (1914) 425.—*T. setaceum* Tausch in Flora, XII (1829) 11, nom. nov. (for *Achillea myriophylla* Willd.).—*T. millefoliatum* F. and M. in DC. Prodr. VI (1837) 128; Ldb. Fl. Ross. II, 602; Manden. in Fl. Gruzii, VIII, 373.—*T. szowitsii* (C. Koch) Sosn. and Takht. in Takht. and Fler. Fl. Erevana (1945) 311; Grossh. Opred. Rast. Kavk. 462.—*Achillea abrotanifolia* L. Sp. pl. (1753) 897.—*A. myriophylla* Willd. Enum. hort. Berol. II (1809) 916, non *Tanacetum myriophyllum* Willd.—*Gymnocline szovitsii* C. Koch in Linnaea, XXIV (1851) 340.—*Pyrethrum polyphyllum* Boiss. Fl. or. III (1875) 351, nom. nov. (for *Tanacetum millefoliatum* F. and M.); Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 51.—*P. szowitsii* (C. Koch) Grossh. and Schischk. Pl. or exs. (1924) 13; Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 84; Grossh. Fl. Kavk. IV, 130, non Boiss. 1849.—*Chrysanthemum szowitsii* (C. Koch) Bordz. in Zap. Kievsk. Obshch. Estestv. XXV (1915) 123.—**Exs.**: Pl. or exs. No. 45.

Perennial. Plants 30–100 cm high, with creeping, more or less branched rhizome; stems solitary or few, erect, extensively leafy, usually more or less branched at apex. Leaves sparsely covered with short bifid hairs, partly simple, with inconspicuous punctate-glandular hairs; basal leaves usually withering early; cauline leaves up to 20 cm long and 6 cm wide, lower on rather long petiole thickened at base, upper sessile or sub-sessile; their lamina oblong or linear-oblong, thrice pinnately cut up to wingless or almost wingless axis; terminal segments narrow-linear and linear-lanceolate, acute; uppermost leaves twice pinnately cut, smaller. Capitula 15–80, in rather dense, compound corymbs. Involucre 4–5 mm in dia and 3.5–4.5 mm long, glabrous or
330 subglabrous; involucre bracts coriaceous-herbaceous, outer lanceolate,

almost lacking membranous border, inner linear-oblong, with narrow but apically broader, light-colored or brownish membranous border. Corolla of tubular florets 2.4–3.0 mm long, usually smaller in few outer pistillate florets. Achenes 1.8–2.4 mm long and about 0.5–0.8 mm wide, corona 0.3–0.4 mm long. Flowering June to August.

Stony slopes, scrubs, riverbanks, gravel beds; up to upper mountain zone.—*Caucasus*: Southern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from garden specimens, apparently acquired from Turkey. Type in London.

Note. The species has an extremely complex synonym in which the oldest names (*Achillea abrotanifolia* L. and *Tanacetum setaceum* Tausch.) were not even mentioned in the later botanical literature, beginning with “*Flora Orientalis*” of E. Boissier.

Section 3. *Xanthoglossa* (DC.) Sch. Bip. *Tanacet.* (1844) 48.—*T.* sect. *Xanthogymnocline* Sch. Bip. *ibid.* 47.—*Pyrethrum* **chrysanthema* MB. *Fl. taur.-cauc.* II (1808) 326, nom. nud.—*P.* sect. *Xanthoglossa* DC. *Prodr.* VI (1837) 60 p. p.—*P.* sect. *Gymnoclines* DC. *ibid.* 58 p. p.—*P.* sect. *Chrysoglossa* C. Koch in *Linnaea*, XXIV (1851) 332.—*P.* sect. *Gymnocline* subsect. *Xanthogymnocline* (Sch. Bip.) Sosn. in *Tr. Tifl. Bot. Sada*, XVII (1915) 46.—*Gymnocline* Cass. in *Dict. sc. nat.* XX (1821) 119 p. p.—*G.* sect. *Chrysactis* C. Koch in *Linnaea*, XXIV (1851) 339.—*Chrysanthemum* sect. *Gymnoclinia* Benth. and Hook. *Gen. pl.* II (1873) 427; Hoffm. in *Pflanzenfam.* IV, 5 (1894) 277.—*C.* sect. *Gymnoclines* (DC.) Ling in *Contr. Inst. Bot. Nat. Acad. Peiping*, III (1935) 481.—More or less hairy (mainly long or short bifid hairs, often mixed with simple) plants 10–60 cm high, always with short (as rosulla of basal leaves) nonflowering shoots, and more sparsely leafy stems. Capitula (2)4–40(80), in dense or lax, usually irregular corymb, less often solitary, with or lacking ligulate florets. Involucre cupuliform, 2.5–15.0 mm in dia, outer involucre bracts two-fifths to two-thirds as long as inner. Receptacle weakly to strongly convex, punctate-tuberculate. Achenes 1.5–3.5 mm long, with 5–12 prominent longitudinal ribs and 0.1–0.7 mm long corona: corona undivided but sometimes irregularly lobed almost to base.

Lectotype of section: *T. millefolium* (L.) Tzvel.

Note. The section with the largest number of species, particularly widely distributed in countries of Northwest Asia.

Series 1. *Myriophylla* Sosn. in *Izv. Kavk. Muz.* X (1916) 17.—Capitula lacking true ligulate florets, usually numerous in regular and rather dense, corymb. Involucre 2.5–6.5 mm in dia; outer involucre
331 bracts lanceolate or ovate-lanceolate, lacking or almost lacking

membranous border; capitulum weakly convex. Herbaceous plants with twice pinnately cut leaves.

6. **T. myriophyllum** Willd. Achill. (1789) 50 and Sp. pl. III (1803) 1814.—*Achillea bipinnata* L. Sp. pl. (1763) 1265, non *Tanacetum bipinnatum* Sch. Bip. 1844.—*Pyrethrum myriophyllum* var. *subvirescens* DC. Prodr. VI (1837) 59; Ldb. Fl. Ross. II, 555.—*P. myriophyllum* auct. non C.A.M.; Boiss. Fl. or III, 350 p. p.; Grossh. Fl. Kavk. IV, 131 and Oprod. Rast. Kavk. 459 p. p.; Manden. in Fl. Gruzii, VIII, 371.—*P. szowitsii* Boiss. Diagn. ser. 1, XI (1849) 25.—*Gymnocline argyrophylla* C. Koch in Linnaea, XXIV (1851) 340.—*Chrysanthemum myriophyllum* (Willd.) Nabel. in Publ. Fac. Sc. Univ. Masaryk. Brno, No. 52 (1925) 23.—Ic.: Takht. and Fedor. Fl. Erevana, Atlas (1946) Plate 110.

Perennial. Plants 20–60 cm high, with thick, more or less branched rhizome, more or less grayish or dull-green from rather dense appressed pubescence of bifid hairs mixed with simple. Stems usually rather numerous, loosely caespitose with short nonflowering shoots, less often solitary, erect, relatively densely leafy, more or less branched only at base and apex. Young leaves densely pubescent, later grayish or dull-green from more or less dense pubescence, with numerous punctate-glandular hairs; basal leaves up to 20(25) cm long, 3(4) cm wide, on rather long (but shorter than lamina) petiole; their lamina oblong or oblong-linear, twice pinnately cut; terminal segments broadly obovate to oblong, up to 1–1.5 mm wide, in turn 2–5-lobed, roundish at apex, but with very short cusp; cauline leaves 3–10, like basal, but smaller, upper sessile, lower short-petiolate. Capitula (10)20–60(80), in rather dense, compound, corymb, on more slender (0.5)1.0–8.0(10.0) mm long peduncles, more or less covered with appressed fine hairs. Involucre 2.5–3.5 mm in dia, 3.5–4.5 mm long, at base densely appressed hairy; involucre bracts coriaceous-herbaceous, outer lanceolate, almost lacking membranous border, inner 1.5–2 times as long, oblong or linear-oblong, with narrow but apically broader, light-colored, membranous border; outer pistillate florets between tubular and ligulate, sometimes with up to 1.5 mm long deeply 3-parted ligule; corolla of tubular disk florets 1.8–2.5 mm long. Achenes 1.5–2.0 mm long and about 0.6 mm wide, with 5–7 longitudinal ribs; corona 0.1–0.3 mm long, irregularly lobed up to middle. Flowering June to August.

Stony and rubbly slopes, rocks; up to 2,500 m.—*Caucasus*: Eastern Transcaucasia (western and southern parts), Southern Transcaucasia, Talysh. *General distribution*: Armenia-Kurdistan. Described from “Orient,” probably from northeastern Turkey. Type in London.

Note. "*Tanacetum myriophyllum* Willd." is actually a new name given to *Achillea bipinnata* L. without any basis. In the botanical literature on the Caucasus, this species has usually been confused with *Pyrethrum myriophyllum* C.A.M., described quite independently. Apparently, the only specimen of *T. myriophyllum* at my disposal from Borzhomi (on the rocks of the ravine between Kazak settlement of Sakogavi and the village of Sakogavi, 14.VII.1918, V. Kozlovsky) belongs to a unique ecogeographical race (tentatively named by us as ssp. *borshomicum* Tzvel. ssp. nova); it is similar to that species on the basis of the size of the capitula, but has abundant flocculent-tomentose pubescence on the peduncles of the capitula and the involucre and also on the average has longer outer involucre bracts.

7. **T. duderanum** (Boiss.) Tzvel. comb. nova.—*Pyrethrum myriophyllum* C.A.M. Verzeichn. Pfl. Cauc. (1831) 74; DC. Prodr. VI, 59, excl. var.; Ldb. Fl. Ross. II, 554; Boiss. Fl. or. III, 350 p. p.; Grossh. Fl. Kavk. IV, 131 and Opred. Rast. Kavk. 459, p. p., non *Tanacetum myriophyllum* Willd. 1789.—*P. duderanum* Boiss. Diagn. ser. 1, XI (1849) 26.—*P. myriophyllum* var. *eriocephalum* Boiss. Fl. or. III (1875) 350; Grossh. Fl. Kavk. IV, 132.—*Gymnocline myriophylla* (C.A.M.) C. Koch in Linnaea, XXIV (1851) 339.—*Chrysanthemum myriophyllum* (C.A.M.) B. Fedtsch. Rast. Turk. (1915) 737, quoad nomen.—**Exs.:** Kotschy, Pl. Pers. bor. No. 266.

Perennial. Plants 20–50 cm high, with thick, more or less branched rhizome, more or less grayish from rather dense, appressed bifid and simple hairs; stems usually numerous, less often solitary, erect, branched only at base and apex. Leaves like previous species. Capitula (5)10–35(45), in dense, compound corymb, on few thick peduncles (1)3–15(20) mm long and sparsely covered with abundant sparse pubescence. Involucre 3.5–5.5 mm in dia 4–5 mm long, densely tomentose near base; involucre bracts coriaceous-herbaceous, outer broadly lanceolate, almost lacking membranous border, inner linear-oblong, with wider light colored or brownish membranous border. Outer pistillate florets and tubular disk florets like previous species; achenes 1.5–2.0 mm long, about 0.6 mm wide, with 5–7 elongate ribs and 0.1–0.3 mm long, more or less lobed corona. Flowering June to July.

Stony and rubbly slopes; from 1,000 to 2,500 m.—*Caucasus*: Talysh (southern part). *General distribution*: Iran-Afghanistan (north-western part). Described from northern Iran (Dudera Mountain). Type in Geneva; isotype in Leningrad.

Note. It replaces the previous species in the extreme south of Talysh and in the mountains of northern Iran (Bogrov-Dag and Elburz ranges).

- 333 8. **T. heterophyllum** Boiss. Diagn. ser. 1, VI (1845) 90.—*T. kotschy* Boiss. in Kotschy. Pl. Pers. austr. No. 433, nom. nud.; Winkl. in Tr. Peterb. Bot. Sada, XI, 2 (1889) 126, nom. nud.—*Pyrethrum myriophyllum* var. *variegatum* Boiss. Fl. or. III (1875) 351; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 188.—*Chrysanthemum myriophyllum* (C.A.M.) B. Fedtsch. Rast. Turk. (1915) 737, quoad pl.—*Lepidolopsis kotschy* (Boiss.) Poljak. in Fl. Turkm. VII (1960) 108.—Exs.: Kotschy, Pl. Pers. austr. No. 433 (isotypes).

Perennial. Plants 15–30 cm high, with thick, more or less branched rhizome, grayish from densely appressed bifid and simple hairs. Stems few or solitary, erect or ascending at base, densely leafy, more or less branched only at base and apex. Leaves grayish from dense pubescence, with numerous, inconspicuous punctate-glandular hairs; basal leaves up to 8(10) cm long and 1.5 cm wide, on rather long petiole; their lamina oblong-linear, twice pinnately cut; terminal segments obovate to broadly linear, up to 1 mm wide, in turn often 2–5-lobed or pinnate, roundish at apex, but often with very short cusp; cauline leaves 3–7, like basal, but sessile except lowermost. Capitula (1)5–15(20) on single stem, in dense, simple or compound corymb, on somewhat thick sparsely hairy, 0.2–1.0 cm long peduncles. Involucre 5.0–6.5 mm in dia, 3.5–5 mm long, densely appressed hairy at base; involucre bracts coriaceous-herbaceous, outer ovate-lanceolate, with very narrow membranous border, inner 1.5–2.5 times as long, oblong-linear, with narrow but appendiculately broadened at apex, light-colored or brownish, membranous border. Outer pistillate florets between tubular and ligulate, sometimes with up to 1.5 mm long, 3-lobed ligules; corolla of tubular disk florets 2.4–3.0 mm long. Achenes 1.8–2.2 mm long, about 0.6 mm wide, with 5–8 longitudinal ribs and 0.1–0.3 mm long, more or less irregularly toothed corona. Flowering June to August.

Stony slopes, steppes; at 1,500–2,500 m.—*Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Iran. Described from Iran (near the city of Shiraz). Type in Geneva; isotype in Leningrad.

Series 2. Gymnoclinoidea Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 40.—Capitula with ligulate florets, usually rather numerous, in regular, rather dense corymb. Involucre 3.5–5.5 mm in dia; outer involucre bracts lanceolate, lacking or almost lacking membranous border. Receptacle weakly convex. Herbaceous plants with pinnatisect leaves (leaf segments undivided or irregularly lobed).

- 334 9. **T. tamrutense** (Sosn.) Sosn. in Takht. and Fed. Fl. Erev. (1945) 312.—*Chrysanthemum tamrutense* Sosn. in Vestn. Tifl. Bot. Sada, XXVII (1913) 11.—*Pyrethrum tamrutense* (Sosn.) Sosn. in Tr. Tifl.

Bot. Sada, XVII (1915) 41 and in Zhurn. Russk. Bot. Obshch. XIV, 84; Grossh. Opred. Rast. Kavk. 459.—*P. woronowii* Sosn. in Izv. Kavk. Muz. X (1916) 6; Grossh. Fl. Kavk. II, 131 and Opred. Rast. Kavk. 459.—**lc.**: Sosn. op. cit. (1913) Plate II.

Perennial. Plants 10–40 cm high, with thick, more or less branched rhizome, grayish-green or dull green from rather dense pubescence of appressed bifid (mixed with simple) hairs. Stems solitary or few, erect, rather uniformly but sparsely leafy, more or less branched only at apex (in inflorescence). Leaves grayish-green or dull green from rather dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves up to 12(15) cm long, 2.5(3) cm wide, on long (sometimes exceeding lamina), basally thickened petiole; their lamina oblong to oblong-linear, pinnately cut, with 3–8 distant linear or linear-lanceolate segments on each side, usually narrowed toward base, undivided or partly irregularly pinnately parted or lobed, with short cartilaginous cusp; cauline leaves smaller, except lower, sessile, pinnately cut, with undivided segments. Capitula 5–25, in rather dense, regular corymb, on (2)4–12(15) mm long peduncles. Involucre 3.5–5.5 mm in dia, 4–5.5 mm long, more or less appressed hairy almost throughout; involucre bracts coriaceous-herbaceous, outer fewer, lanceolate or narrow-lanceolate, gray, lacking membranous border, inner oblong-linear, 1.5 times, less often 2 times as long as outer, with narrow, light colored, membranous border, terminating into small uniformly toothed appendage at apex of bract. Outer pistillate florets ligulate, 4–8, bright yellow, corolla tube 1.2–1.8 mm long and ligules 3–5.5 mm long and 2.5–4 mm wide, broadly ovate; corolla of tubular disk florets 2.4–3.0 mm long. Achenes 1.8–2.5 mm long, about 0.5 mm wide, with 5 longitudinal ribs and undivided 0.2–0.3 mm long irregularly toothed corona. Flowering June to July.

Stony and clayey, usually solonchic slopes, rocks; in lower mountain zone.—*Caucasus*: Eastern Transcaucasia (reported from the village of Shordzha), Southern Transcaucasia. *General distribution*: Turkey (northeastern part), Iran (northwestern part). Described from northeastern Turkey (Olta region). Type in Tbilisi.

Note. The species is quite close to *T. flavovirens* (Boiss.) Tzvel. comb. nova [= *Pyrethrum flavovirens* Boiss. Diagn. ser. 1, IV (1844) 10], described from Iran, whose isotype is preserved in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, differing from it only by having copious pubescence on the involucre bracts and usually more dissected leaves. Judging from the isotype of *Pyrethrum woronowii* Sosn., in the herbarium of the Botanical Institute, Academy of Sciences of the USSR, this species is not different from *C. tamrutense*.

Series 3. *Tabrisiana* Tzvel.—Capitula lacking true ligulate florets, solitary. Involucre 5–9 mm in dia; outer involucre bracts ovate-lanceolate, acuminate, lacking membranous border. Receptacle weakly convex, almost flat. Plants more or less woody at base, with pinnately cut leaves (segments pinnately parted or lobed).

10. ***T. tabrisianum*** (Boiss.) Sosn. and Takht. in Takht. and Fed. Fl. Erevana (1945) 310; Grossh. Opred. Rast. Kavk. 462.—*Pyrethrum tabrisianum* Boiss. Fl. or. III (1875) 356; Grossh. Fl. Kavk. IV, 130.—*Chrysanthemum tabrisianum* (Boiss.) Bornm. in Beih. Bot. Centralbl. LX, 3 (1939) 194, in obs.

Perennial. Plants 10–30 cm high, with thick oblique rhizome, more or less grayish-green from rather dense pubescence of appressed bifid (mixed with simple) hairs. Stems usually numerous, caespitose, erect, sparsely leafy, branched only at more or less woody base. Leaves more or less grayish-green from rather dense pubescence, young leaves densely hairy, with inconspicuous punctate-glandular hairs; basal leaves up to 8 cm long and 1.3 cm wide, on rather long petiole, with pinnately cut, linear or oblong-linear lamina; leaf segments 8–12 on each side, more or less pinnately lobed or parted; terminal segments oblong or obovate, to 1.5 mm wide, roundish at apex, usually with short cusp; few cauline leaves strongly reduced, almost all short-petiolate, upper pinnately parted or undivided. Capitula solitary (but many on a single plant) on up to 10–15 cm long peduncles. Involucre 5–9 mm in dia and 6–8 mm long, more or less appressed hairy; involucre bracts coriaceous-herbaceous, outer ovate-lanceolate, acuminate, lacking membranous border, inner 1.5–2 times as long, oblong-linear, with light colored membranous border only in upper part, modified at apex into oblong, usually sub-acute appendage. Outer pistillate florets tubular, partly modified into ligulate, few; corolla of tubular disk florets 2.2–3.0 mm long. Achenes 2.8–3.6 mm long and about 0.6 mm wide, with 7–10 longitudinal ribs and 0.3–0.6 mm long undivided irregularly toothed corona. Flowering June to August.

Stony slopes, rocks; at 1,000–2,000 m.—*Caucasus*: Reported from Southern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from Iran (vicinity of Tabriz). Type in Geneva; isotypes in Leningrad.

336 **Note.** I have not seen specimens of this species from the USSR, but maybe they are preserved in some herbaria of the Caucasus.

Series 4. *Canescentia* Tzvel.—Capitula lacking true ligulate florets, (2)4–10(15), at stem apex in very dense, almost capitate corymb. Involucre 3.5–5.5 mm in dia; outer involucre bracts lanceolate, acute,

lacking membranous border. Receptacle weakly convex, almost flat. Herbaceous plants with pinnately cut leaves (leaf segments pinnately parted or lobed).

11. **T. canescens** DC. Prodr. VI (1837) 129; Ldb. Fl. Ross. II, 602; Grossh. Opred. Rast. Kavk. 462.—*T. incanum* Fisch. and Mey. ex DC. l. c. in syn. non Willd. 1803.—*Pyrethrum canescens* (DC.) Boiss. Fl. or. III (1875) 353; Sosn. in Tr. Tifl. Bot. Sada, XVII, 54; Grossh. Fl. Kavk. IV, 130.—*Chrysanthemum canescens* (DC.) Rech. f. in Oest. Bot. Zeitschr. XCVII (1950) 231, in obs.—**Ис.**: Takht. and Fed. Fl. Erevana, Atlas (1946) Plate 109.

Perennial. Plants 15–50 cm high, with thick oblique rhizome, more or less grayish-green from rather dense pubescence of appressed bifid and simple hairs. Stems solitary or few, erect, sparsely leafy, more or less branched only near very weakly woody base and in inflorescence. Leaves grayish-green from rather dense pubescence, with numerous punctate-glandular hairs; basal leaves up to 8 cm long and 1.2(1.5) cm wide, on rather long petiole, with pinnately cut, oblong or oblong-linear lamina; leaf segments 5–12 on each side, pinnately parted or lobed; terminal segment broadly linear to obovate and even almost semicircular, to 1.5 mm wide, apex roundish, often with short cusp; cauline leaves reduced and less dissected, middle and upper usually sessile. Capitula (2)4–10(15), compactly clustered at stem apex in very dense, almost capitate corymb, on peduncles 1–5(8) mm long and finely tomentose. Involucre 3.5–5.5 mm in dia, 4–6.5 mm long, poculiform, basally more or less covered with appressed hairs; involucre bracts coriaceous-herbaceous, outer lanceolate, acute, lacking membranous border, inner 1.5–2 times as long as outer, broadly linear, with narrow and light-colored membranous border in upper part, broadening at apex in a small discontinuously fimbriate appendage along margin. Outer pistillate florets tubular, few; corolla of tubular disk florets 2.4–3.0 mm long. Achenes 2.2–3.0 mm long, about 0.6 mm wide, with 10–15 longitudinal ribs (of which 3–6 ribs usually more prominent), corona 0.1–0.2 mm long, irregularly lobed almost to base. Flowering June to July.

Rubby, stony and clayey slopes; up to lower mountain zone.—**Caucasus**: Southern Transcaucasia. *General distribution*: Iran (north-western part). Described from Nakhichevan ASSR. Type in Geneva; isotypes in Leningrad.

337 **Note.** Very variable in the size and pubescence of the capitula and the form of the leaves. The only specimen of this species from Armenia (vicinity of Yerevan near the village of Dzghirmich, 35.V.1922, A. Grossheim) in the Herbarium of the Botanical Institute, Academy of Sciences of the USSR has leaves with fewer segments, which are ir-

regularly toothed or lobed along the margin and more or less acute at the apex, and it is possible to treat it as a separate ecogeographical race, which we tentatively call spp. *erivanense* Tzvel. ssp. nova. *T. canescens* var. *parvifolium* DC. (Prodr. VI, 129) from the vicinity of the city of Nakhichevan, with shorter leaf lobes, apparently is of no taxonomic importance.

Series 5. Songarica Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 166.—Capitula (1)3–10(18), lacking true ligulate florets, in dense and regular corymb. Involucre (5)6–10(12) mm in dia; outer involucre bracts lanceolate, subacute, lacking membranous border. Receptacle weakly convex. Herbaceous plants with twice pinnately cut leaves.

12. **T. tanacetoides** (DC.) Tzvel. comb. nova.—*T. meyerianum* Sch. Bip. Tanacet. (1844) 47.—*Pyrethrum millefoliatum* auct. non Willd.: Ldb. Fl. Alt. IV (1833) 120.—*P. tanacetoides* DC. Prodr. VI (1837) 59; Ldb. Fl. Ross. II, 555; O. and B. Fedtsch. Perech. Rast. Turk. IV, 188; Kryl. Fl. Zap. Sib. XI, 2753.—*P. millefoliatum* var. *tanacetoides* (DC.) Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 2 (1866) 347.—*Chrysanthemum millefoliatum* var. *tanacetoides* (DC.) Kryl. Fl. Alt. III (1904) 622.—*C. tanacetoides* (DC.) B. Fedtsch. Rast. turk. (1915) 737.—**lc.**: Ldb. Icon. pl. fl. Ross. impr. Alt. IV (1833) t. 369.

Perennial. Plants 15–60 cm high, with short creeping, more or less branched rhizome, usually grayish-green from rather dense pubescence of appressed bifid and simple hairs. Stems solitary or few, erect, sparsely leafy, more or less branched only at apex. Leaves grayish-green, less often dull green, from rather dense pubescence, with inconspicuous punctate-glandular hairs; basal leaves up to 15–20 cm long and 3 cm wide, on rather long petiole, with twice pinnately cut, oblong to oblong-linear lamina; terminal segments linear to ovate, up to 1.5 mm wide, subacute; cauline leaves smaller, except lower, sessile. Capitula (1)3–10(15), at stem apex, in dense, regular corymb on somewhat thick, finely tomentose peduncles up to 1.5–2 cm long. Involucre (5)6–8(10) mm in dia and 4–5 mm long, more or less appressed-hairy; involucre bracts coriaceous-herbaceous, outer lanceolate, lacking membranous border, inner oblong-linear, 1.5–2 times as long, with narrow but apically broadened, light colored, membranous
338 border. Outer pistillate florets more or less transitional between tubular and ligulate, sometimes with ligules up to 1.5 mm long; corolla of tubular disk florets 2–2.5 mm long. Achenes 2.0–2.5 mm long, about 0.6–0.8 mm wide, with 6–8 longitudinal ribs corona 0.1–0.3 mm long more or less irregularly toothed. Flowering July to August.

Stony slopes, steppes; up to middle mountain zone.—*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai. *General distribution*: China (Dzhungaria). Described from southern Altai. Type in Geneva; isotypes in Leningrad.

13. **T. crassipes** (Stschegl.) Tzvel. comb. nova.—*Pyrethrum crassipes* Stschegl. in Bull. Soc. Nat. Mosc. XXVII (1854) 172; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 189.—*Chrysanthemum crassipes* (Stschegl.) B. Fedtsch. Rast. Turk. (1915) 737.

Perennial. Plants 25–60 cm high, with short creeping, more or less branched rhizome, dull green or grayish-green from rather dense pubescence of appressed bifid (mixed with simple) hairs. Stems solitary or few, erect, sparsely leafy, branched only at apex (in inflorescence). Leaves like previous species, but usually less densely hairy. Capitula (2)3–8(15), at stem apex, in very dense, almost capitate corymb, on strongly thickened, finely tomentose, peduncles up to 1(1.5) cm long. Involucre (6)8–10(12) mm in dia and 4.0–5.5 mm long, more or less appressed hairy; involucre bracts like previous species. Outer pistillate florets tubular, sometimes ligulate; corolla of tubular florets 2.0–2.6 mm long. Achenes 2.0–2.5 mm long, about 0.6–0.8 mm wide with 6–8 longitudinal ribs, corona 0.1–0.3 mm long, more or less irregularly toothed. Flowering July to August.

Stony slopes, steppes, forest glades; in middle mountain zone.—*Western Siberia*: Altai (southern part); *Soviet Central Asia*: Dzhungaria-Tarbagatai. *General distribution*: China (Dzhungaria). Described from Altai (Naryn Range). Type in Moscow(?); isotypes in Leningrad.

Note. In relation to the previous species, it apparently is a higher-mountain ecogeographical race, connected by intermediate forms.

Series 6. Santolina Tzvel.—Capitula lacking true ligulate florets, (1)2–10(15), in lax, not always regular, corymbose inflorescence. Involucres 4–12 mm in dia; outer involucre bracts lanceolate or ovate-lanceolate, with or lacking narrow membranous border. Receptacle weakly convex. Herbaceous plants with twice pinnately cut leaves.

341 14. **T. turlanicum** (Pavl.) Tzvel. comb. nova.—? *T. barclayanum* DC. Prodr. VI (1837) 128; Ldb. Fl. Ross. II, 602.—*Pyrethrum achilleifolium* var. *discoideum* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 382.—*P. turlanicum* Pavl. in Vestn. Akad. Nauk Kazakhsh. SSR, No. 3 (1950) 39.—*P. mindshelkense* B. Fedtsch. in herb.—*P. kasakhstanicum* ssp. *karataviense* Krasch. in herb.—**lc.**: Pavl. op. cit. 38, Fig. 13.—**Exs.**: GRF No. 3269b (*P. kasakhstanicum* Krasch.).



1 — *Tanacetum tenuissimum* (Trautv.) Grossh., habit of plant, corolla of tubular floret, and achene; 2 — *T. akinfievii* (Alexeenko) Tzvel., habit of plant, corolla of ligulate floret, corolla of tubular floret, and achene.

Perennial. Plants 15–40 cm high, with short creeping, more or less branched rhizome, usually grayish-green from rather profuse pubescence or appressed bifid and simple hairs. Stems solitary or rather numerous, erect or ascending at base, sparsely leafy, usually branched above middle, less often almost from base, sometimes simple. Leaves grayish-green or dull-green from rather profuse pubescence, with inconspicuous punctate glands; basal leaves up to 15–20 cm long and 3 cm wide, on rather long petiole, twice pinnately cut, oblong to oblong-linear, terminal segments linear-lanceolate to ovate, up to 1.5 mm wide, short-acuminate; cauline leaves smaller, lower short-petiolate, middle and upper sessile. Capitula (1)2–5(10) on a single stem, in lax, not always regular corymbose inflorescence, on peduncles more or less finely tomentose, 1–10 cm long. Involucres 7–12 mm in dia, 1.5–5 mm long, more or less appressed hairy; involucre bracts coriaceous-herbaceous, outer lanceolate and lanceolate-ovate, usually lacking membranous border, inner oblong, 1.5–2.5 times as long as outer, with narrow, lighter or brownish, membranous border. Peripheral pistillate florets tubular but often more or less transitional to ligulate; corolla of tubular florets of disk 2.2–2.6 cm long and about 0.7 mm wide, with 5–8 longitudinal ribs, corona 0.2–0.3 mm long, more or less irregularly toothed. Flowering July to August.

Rubbly and stony slopes, rocks; in lower and middle mountain zones.—*Western Siberia*: Altai (southern part); *Soviet Central Asia*: Lake Balkhash Region (sporadically), Dzhungaria-Tarbagatai, Tien Shan (Karatau, Talass Alatau) and Ugam ranges. *General distribution*: China (Dzhungaria). Described from Karatau. Type in Alma-Ata; isotype in Moscow.

Note. According to the very brief original description, *T. barclayanum* DC. (op. cit.) is very similar to this species. It was described from cultivated specimens of unknown origin. Unfortunately, the herbarium of the Botanical Institute of the Academy of Sciences of the USSR does not have reliably identified specimens of this species.

The higher-mountain (and usually also smaller) specimens of *T. turanicum*, with a relatively wider, brownish, membranous border on the involucre bracts, possibly belong to a separate ecogeographical race, named in the herbarium by B.A. Fedtschenko as "*Pyrethrum mindshelkense* B. Fedtsch" (based on collections from Mynzhilga Mountain in the Karatau, 15.VI.1908, No. 516).

15. ***T. scopulorum*** (Krasch.) Tzvel. comb. nova.—*Pyrethrum scopulorum* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 164.—*Lepidolopsis scopulorum* (Krasch.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 376.—**lc.**: Krasch. op. cit. 167, fig. 6.

Perennial. Plants 20–50 cm high, with short creeping, more or less branched rhizome, sometimes with appressed bifid and simple hairs. Stems solitary or rather numerous, erect, sparsely leafy, usually branched above middle, less often almost from base, sometimes simple. Leaves green or dull green, usually pubescent to subglabrous, with numerous punctate glands; basal leaves up to 8–10 cm long and 1.5 cm wide, rather long-petiolate, pinnately cut, broadly linear, segments of the first order pinnately lobed or parted; terminal lobe lanceolate-ovate to oblong-lanceolate, up to 1.5 mm wide acuminate; cauline leaves strongly reduced, middle and upper sessile, often pinnately parted or lobed. Capitula (1)3–8(12) on single stem, in very lax, often irregular, almost always simple corymbose inflorescence, on sparsely hairy, 2–20 cm long peduncles. Involucres 7–12 mm in dia, 4.0–6.5 mm long, more or less appressed hairy; involucre bracts coriaceous-herbaceous, outer broadly lanceolate, almost lacking membranous border, inner oblong, 1.5–2.5 times as long, with narrow, light colored, membranous border. Peripheral pistillate florets tubular, but often more or less transitional to ligulate; corolla of tubular florets of disk 2.2–2.6 mm long. Achenes 2.0–2.5 mm long and about 0.6–0.8 mm wide, with 6–9 longitudinal ribs, corona more or less irregularly toothed along upper edge, 0.2–0.3 mm long. Flowering June to August.

Granite rocks, stony slopes, in lower mountain zone.—*Soviet Central Asia*: Lake Balkhash Region (Karkarala Mountains). Endemic. Described from the Karkarala Mountains (Bektau-Ata Mountain). Type and isotypes in Leningrad.

16. **T. saxicolum** (Krasch.) Tzvel. comb. nova.—*Pyrethrum kashgarianum* ssp. *saxicola* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 162.

343 Perennial. Plants 20–35 cm high, with short, creeping, more or less branched rhizome, sometimes with appressed bifid and simple hairs. Stems solitary, or rather numerous, erect or ascending at base, sparsely leafy, more or less branched above middle, sometimes simple. Leaves green or dull green, usually sparsely hairy, with numerous punctate glands. Basal leaves up to 10–12 cm long and 1.8 cm wide, rather long-petiolate, pinnately cut, oblong-linear, their lobes more distant than in previous species, pinnately lobed or irregularly toothed; terminal lobe and teeth short-acuminate; cauline leaves strongly reduced, upper and middle sessile, uppermost often pinnately lobed or even entire. Capitula (1)2–6(10) on single stem, in lax, not always regularly corymbose inflorescence, on peduncles sparsely hairy, 1–8 cm long. Involucre 5–12 mm in dia, 4.0–5.5 mm long, more or less appressed hairy; involucre bracts coriaceous-herbaceous, outer broadly lanceolate,

with very narrow membranous border, inner oblong, 1.5–2.5 times as long, with narrow, light-colored membranous border, more or less broadened at apex. Peripheral pistillate florets tubular, but often more or less transitional to ligulate; inner tubular florets of disk 2.2–2.6 mm long. Achenes 2.0–2.5 mm long, about 0.7 mm wide, with 6–9 longitudinal ribs, corona 0.2–0.3 mm long, more or less irregularly toothed. Flowering June to August.

Rubbly and stony slopes, rocks; up to lower mountain zone.—*Soviet Central Asia*: Aralo-Caspian Region (Mugodzhary and much higher parts of “melkosopchnik” [low, rounded, isolated hill]. Endemic. Described from the Mugodzhary Mountains. Type (Aktyubinsk Region, Mugodzhary Mountains, high ridge in region of Baktubai Mountains near village of Berchogur, 26.VI.1927, No. 587, I. Krascheninnikov) and isotypes in Leningrad.

Note. The most typical plants of this species are found in the Mugodzhary Mountains, while the majority of the specimens from the Kazakh “melkosopchnik” exhibit more or less intermediate features between this and the other species of the series.

17. **T. santolina** Winkl. in Tr. Peterb. Bot. Sada, XI, 12 (1891) 375; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 207.—*Chrysanthemum santolina* (Winkl.) B. Fedtsch. Rast. Turk. (1915) 738.—*Pyrethrum kasakhstanicum* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 160.—**lc.**: Krasch. op. cit. 161, fig. 3.—**Exs.**: GRF No. 3269a (isotypes of *P. kasakhstanicum* Krasch.).

344 Perennial. Plants 10–35 cm high, with short creeping, more or less branched rhizome, usually grayish from rather profuse pubescence of appressed bifid and simple hairs. Stems rather numerous, less often solitary, erect or ascending at base, strongly leafy, more or less branched above, less often simple. Leaves usually grayish-green from rather profuse pubescence, with numerous, though not always conspicuous, punctate glands. Basal leaves up to 8(12) cm long and 1.0(1.5) cm wide, rather long-petiolate, twice pinnately cut, linear or broadly linear; terminal lobe ovate to oblong-linear, up to 1.0(1.5) mm wide, short-acuminate; cauline leaves strongly reduced and less divided, middle and upper sessile. Capitula (1)3–10(15) on a single stem, in lax, not always regularly corymbose inflorescence, on more or less tomentose, peduncles 1–8 cm long. Involucres 4–7 mm in dia; 3.0–4.5 mm long, at base and dorsally bracts more or less appressed hairy; involucre bracts coriaceous-herbaceous, outer broadly lanceolate, with very narrow membranous border, inner linear-oblong, 1.5 to 2.5 times as long as outer, with relatively narrow, light colored membranous border, more or less broadened at apex. Peripheral pistillate florets more or

less transitional from tubular to ligulate, sometimes with 3 lobed limb up to 1.0(1.5) mm long; corolla of tubular florets of disk 1.8–2.2 mm long. Achenes 1.8–2.2 mm long and about 0.6 mm wide, with 6–9 longitudinal ribs, and corona more or less irregularly toothed or lobed (sometimes almost to base) 0.2–0.4 mm long. Flowering May to July.

Solonetz, solonetzic steppes, semideserts, mainly on clayey and sandy soils.—*European part*: Lower Volga (southern part); *Western Siberia*: Upper Tobol (southern part), Irtysh (southern part), Altai (foothills; rarely); *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Kyzyl-Kum (northern part), Syr-Darya (northern part). *General distribution*: China (western part). Described from Kzyl-Orda Region of Kazakh SSR. Type in Leningrad.

Note. The species is described from specimens with the previous year's dry stems and capitula. In other respects it is entirely similar to the type specimens of *Pyrethrum kasakhstanicum* Krasch.

Series 7. Kittaryana Tzvel.—Capitula with more or less developed ligulate florets, (1)2–6(10), in lax, not always regular corymbose inflorescence. Involucre (5)7–12(15) mm wide; outer involucre bracts lanceolate, lacking membranous border; receptacle moderately convex. Herbaceous plants with twice pinnately cut leaves.

18. **T. karelinii** Tzvel. nom. nov.—*T. saxatile* (Kar. and Kir.) Sch. Bip. Tanacet. (1844) 47, non Lodd. Bot. Cabin. II (1818) t. 126.—*Pyrethrum saxatile* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 382; Ldb. Fl. Ross. II, 555; O. and B. Fedtsch. Perech. Rast. Turk. IV, 188; Kryl. Fl. Zap. Sib. XI, 2754.—*Chrysanthemum saxatile* (Kar. and Kir.) B. Fedtsch. Rast. Turk. (1915) 737.

Perennial. Plants 20–60 cm high, with short creeping, more or less branched rhizome, usually grayish-green from rather profuse pubescence of appressed bifid and simple hairs. Stems few or solitary, erect, sparsely leafy, more or less branched above middle. Leaves usually grayish-green from profuse pubescence, with inconspicuous punctate glands; basal leaves up to 15–20 cm long, 3 cm wide, rather long-petiolate, twice pinnately cut, oblong to oblong-linear; terminal lobe linear to ovate, up to 1.5 mm wide, short-acuminate; cauline leaves
345 much smaller and less divided, middle and upper sessile. Capitula (1)3–6(10) on long (up to 8 cm) peduncles in lax, not always regular, corymbose inflorescence. Involucres (8)10–12(15) mm in dia. 4.0–5.5 mm long, more or less appressed hairy; involucre bracts coriaceous-herbaceous, outer lanceolate, lacking membranous border, inner oblong-linear, 1.5 to 2 times as long as outer, with narrow, light-colored membranous border, withering at apex. Peripheral pistillate florets

ligulate, yellow, 10–25, with 1.2–1.6 mm-long corolla tube, limb 2.4–3.0 mm long and 1.5–2.0 mm wide; inner tubular florets of disk 2.4–3.0 mm long. Achenes 2.4–3.0 mm long, about 0.6 mm wide, with 6–8 longitudinal ribs, and corona 0.3–0.5 mm long, usually irregularly toothed or lobed along the edge. Flowering July to August.

Stony slopes, rocks from 2,000 m. up—*Western Siberia*: Altai (southern part); *Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau). *General distribution*: Dzhungaria-Kashgaria. Described from Dzhungarian. Alatau. Type or isotype(?) in Leningrad.

Note. It is very close to the following species but is a higher mountain ecogeographical race.

19. **T. kittaryanum** (C.A.M.) Tzvel. comb. nova.—*Pyrethrum kittaryanum* C.A.M. in Kleine Beitr. zur. Nähern Kennth. der Fl. Russl. (1830) 4; Stank. in Stank. and Tal. Opred. Rast. Evrop. Ch. SSSR (1949) 632.—*P. millefoliatum* var. *macrocephalum* Ldb. Fl. Ross. II (1846) 557 p. p.—*P. uralense* var. *tomentosum* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 164.—*Chrysanthemum millefoliatum* var. *kittaryanum* (C.A.M.) Krasch. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI (1936) 346.—**Exs.:** GRF No. 3268a (under *Pyrethrum millefoliatum*).

Perennial. Plant (6)10–40(50) cm high, with short creeping more or less branched rhizome, usually grayish-green from rather profuse pubescence of bifid and simple hairs. Stems rather numerous, less often solitary, erect or basally ascending, sparsely leafy, usually more or less branched above middle, less often simple. Leaves usually grayish-green from rather profuse pubescence, with inconspicuous punctate glands; basal and lower cauline leaves up to 10–15 cm long, 3 cm wide, rather long-petiolate, twice pinnately cut, oblong to oblong-linear; terminal lobes linear to ovate, up to 1.5 mm wide, short acuminate; cauline leaves much smaller and less divided, middle and upper sessile. Capitula 1–6(8) on rather long (0.5–10 cm) peduncles, in lax, not always regular, corymbose-inflorescence. Involucre (5)7–10(12) mm in dia and 4.0–5.5 mm long, more or less appressed-hairy; involucre bracts coriaceous-herbaceous, outer bracts lanceolate, lacking membranous border (or almost without), inner oblong-linear, 1.5–2 times as long as outer, with narrow, light colored membranous border broadening at apex. Peripheral pistillate florets ligulate, yellow, 15–40, corolla tube 1.0–1.5 mm long, limb [ligule] 2.5–3.5 mm long and 1.5–2.0 mm wide; corolla of tubular florets of disk 1.8–2.5 mm long. Achenes 2.2–2.6 mm [sic.] long and about 0.6–0.7 mm wide, with 5–10 longitudinal ribs and more or less irregularly toothed or lobed, corona 0.2–0.3 mm long. Flowering June to August.

Steppes, stony and rubbly slopes, up to lower mountain zone.—*European part*: Volga-Kama (southeastern part), Trans-Volga, Lower Volga (northern part); *Western Siberia*: Upper Tobol (southern part), Irtysh (southern part), Altai (western foothills); *Soviet Central Asia*: Aralo-Caspian Region (northern part), Lake Balkhash Region (northern part). Endemic. Described from southern Urals. Type in Leningrad.

Note. The species is described from very small specimens with solitary capitula on the stems. In my opinion, they do not constitute a separate ecogeographical race; hence I combine them with the larger, grayish-pubescent plants bearing several capitula on a stem (*Pyrethrum uralense* var. *tomentosum* Krasch.).

20. **T. uralense** (Krasch.) Tzvel. comb. nova.—*Pyrethrum millefoliatum* auct. non Willd.: Korsh. Tent. Fl. Ross. or. (1898) 214 p. p.—*P. uralense* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 162.—*Chrysanthemum uralense* Krasch. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI (1936) 347, diagnosis in Russian.—**!c.**: Krascheninn, op. cit. (1946) 163, fig. 4.

Perennial. Plant (10)15–40(60) cm high, with short creeping, more or less branched rhizome, sometimes pubescent, with bifid and simple hairs (to subglabrous). Stems rather numerous, less often solitary, erect or basally ascending, sparsely leafy, usually branched above middle, less often simple. Leaves like previous species, but green or dull green, sometimes hairy, often subglabrous (but younger leaves always hairy). Capitula like previous species but involucre more weakly hairy. Peripheral pistillate florets ligulate, yellow, 15–40, corolla tube 1.0–1.5 mm long and limb 2.5–3.5 mm long, 1.5–2.0 mm wide; corolla of tubular florets of disk 1.8–2.5 mm long. Achenes 2.0–2.6 mm long, about 0.6 mm wide, with 5–10 longitudinal ribs and more or less irregularly toothed, corona 0.2–0.3 mm long. Flowering June to August.

Stony and rubbly slopes, rocks up to lower mountain zone.—*European part*: Volga-Kama (southeastern part), Trans-Volga, Lower-Volga (northern part); *Western Siberia*: Upper-Tobol (southern part), Irtysh (southern part); *Soviet Central Asia*: Aralo-Caspian Region (northern part). Endemic. Described from southern Urals. Type in Leningrad.

Note. Distinguished from the previous species only by the much weaker pubescence, this species apparently is a morphologically very weakly isolated ecogeographical race, confined to the more stony and rocky habitats.

347 21. **T. sclerophyllum** (Krasch.) Tzvel. comb. nova.—*Pyrethrum sclerophyllum* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR,

IX (1946) 164.—**lc.**: Krasch. *ibid.* 165, fig. 5.—**Exs.**: GRF No. 3270 (isotype of species).

Perennial. Plant 20–35 cm high, with short, creeping, more or less branched rhizome, more or less covered with bifid and simple hairs. Stems few or solitary, erect, sparsely leafy, more or less branched above middle. Leaves green or dull green, more or less sparsely hairy to subglabrous (but younger leaves always profusely hairy), lacking distinct punctate glands; basal leaves up to 10–15 cm long and 1.8–2.0 mm wide, rather long-petiolate, twice pinnately cut, oblong-linear or broadly linear, hard and on the average less divided than in previous species; terminal lobe linear-oblong to broadly ovate, to 1.5 mm wide, short-acuminate; cauline leaves much smaller and less divided, middle and upper sessile. Capitula (1)2–4(6), on rather long (up to 10 cm) peduncles, in lax, not always regular, corymbose inflorescence. Involucres 10–12 mm in dia, 4.5–5.0 mm long, more or less appressed-hairy; involucre bracts coriaceous-herbaceous, outer lanceolate, almost lacking membranous border, inner oblong-linear, with narrow, light colored, membranous border, at apex broadened like appendage. Peripheral pistillate florets ligulate, yellow, 20–40, corolla tube about 1 mm long and limb 3–4 mm long and 1.5–2.0 mm wide; corolla of tubular florets of disk 2.2–3.0 mm long. Achenes 2.2–3.0 mm long, about 0.6–0.7 mm wide with 6–10 longitudinal ribs, and corona 0.4–0.7 mm long, more or less irregularly toothed along margin. Flowering June to August.

Stony slopes (chalk and limestone outcrops).—*European part*: Volga-Don (eastern part), Trans-Volga (western part), Lower Don (northeastern part). Endemic. Described from vicinity of Khvalynsk on Volga. Type in Leningrad.

Note. The most typical plants of this species are found only in the vicinity of the city of Khvalynsk. Plants from other regions (for example, from the Zhigulei District), often occupy a more or less intermediate position between this and the previous species.

Series 8. *Millefoliata* Sosn. in *Izv. Kavk. Muz.* X (1916) 17.—Capitula with more or less developed ligulate florets, sometimes transitional to tubular, (1)2–15(20), in compact or lax, not always regular corymbose inflorescence. Involucres (4)5–10(12) mm in dia; outer involucre bracts lanceolate-ovate, with rather wide (but fragile) membranous border. Receptacle strongly convex, often obtusely conical. Herbaceous plants with bipinnatisect leaves.

348 22. ***T. odessanum*** (Klok.) Tzvel. *comb. nova.*—*T. incanum* auct. non Willd.: Georgi, *Beschreib Russ. Reich.* VI (1800) 1231; Ldb. *Fl.*

Ross. II, 604.—*Pyrethrum millefoliatum* var. *macrocephalum* Ldb. Fl. Ross. II, 557 p. p.—*P. odessanum* Klok. in Ind. Sem. Horti Bot. Charkow. (1926) 7, and in Vizn. Rosl. USSR (1950) 540.

Perennial. Plants 20–40 cm high, with short, creeping, more or less branched rhizome, grayish-green from profuse appressed and squarrose bifid and simple hairs. Stems few or solitary, erect, sparsely leafy, more or less branched at apex, densely hairy all over. Leaves grayish from profuse pubescence (on prolonged storage of exsiccates, hairs turn brownish), with numerous punctate glands; basal leaves up to 15 cm long and 2 cm wide, rather long-petiolate, twice pinnately cut, oblong-linear, their terminal lobes lanceolate-ovate to narrow-lanceolate, up to 1.5 mm wide, short acuminate; middle and upper leaves strongly reduced, sessile. Capitula 3–15, on relatively short (0.5–4.0 cm long) somewhat thick peduncles in rather compact corymbose inflorescence. Involucres 7–12 mm in dia and 4–5 mm long, at base profusely lanate; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, subacute, inner 1.5–2 times as long [as outer], oblong; all bracts with light colored membranous border, much broader in inner bracts and at apex broadened like appendage. Peripheral pistillate florets ligulate, yellow, 15–40, with corolla tube 1.0–1.2 mm long and limb 2.0–2.8 mm long and 1.5–2.0 mm wide; corolla of tubular florets of disk 1.8–2.5 mm long. Achenes 2.4–2.8 mm long and 0.6–0.7 mm wide, with 6–10 longitudinal ribs, and more or less irregularly toothed corona 0.3–0.5 mm long. Flowering June to August.

Stony steppes, rock outcrops.—*European part*: Middle Dnieper (southwestern part), Bessarabia, Black Sea Region (right bank of Dnieper), Crimea(?). *General distribution*: Romania. Described from vicinity of Odessa. Type in Kiev.

Note. The plants from Crimea occupy a more or less intermediate position between this and the next species.

23. **T. millefolium** (L.) Tzvel. comb. nova. non F. and M. ex Aitch. in Journ. Linn. Soc. XIX (1882) 169 in syn. sphalm. (= *T. millefoliatum*).—*T. tauricum* Sch. Bip. Tanacet. (1844) 48, nom. nov.—*Anthemis millefolia* L. Sp. pl. (1753) 896.—*Chrysanthemum millefoliatum* L. Syst. veg. ed. 12 (1767) 563, nom. nov.; Schmalh. Fl. II, 69.—*Matricaria millefoliata* (L.) Desr. in Lam. Encycl. III (1792) 733.—*Pyrethrum millefoliatum* (L.) Willd. Sp. pl. III (1803) 2160; MB. Fl. taur.-cauc. II, 326; DC. Prodr. VI, 60; Boiss. Fl. or. III, 349 p. p.; O. and B. Fedtsch. Perech. Rast. Turk. IV, 189; Kryl. Fl. Zap. Sib. XI, 2752.—*P. millefoliatum* var. *microcephalum* Ldb. Fl. Ross. II (1845-1846) 557.—? *P. baumanii* Stev. in Bull. Soc. Nat. Mosc. XXIX, 349 4 (1856) 383.— *Ic.*: Gmel. Fl. Sib. II (1749) t. 86, fig. 1; Krascheninn.

in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI (1936) 346, fig. 681.—**Exs.:** GRF Nos. 881 and 3268b.

Perennial. Plant (10)15–40(50) cm high, with short creeping, more or less branched rhizome, usually grayish-green form rather profuse pubescence of appressed bifid and simple hairs. Stems few or solitary, erect or basally ascending, sparsely leafy, more or less branched above, more or less appressed-hairy. Leaves usually grayish from rather profuse pubescence, but on the average weakly pubescent in comparison with previous species, sometimes dull green, with numerous punctate glands; basal leaves up to 10–12 cm long, 2 cm wide, rather long-petiolate, twice pinnately cut, oblong-linear, their terminal lobes lanceolate-ovate to lanceolate-linear, up to 1.5 mm long, short-acuminate; middle and upper cauline leaves strongly reduced, sessile. Capitula (2)3–10(15), on peduncles 0.5–8.0 cm long, in lax, not always regular, corymbose-inflorescence. Involucres 7–10 mm in dia and 4–5 mm long, at base more or less lanate to subglabrous; involucre bracts coriaceous-herbaceous, outer broadly ovate, subacute, inner oblong-lanceolate; all bracts with rather wide, light-colored membranous border, but much broader in inner bracts and at apex widened like appendage. Peripheral pistillate florets ligulate, yellow, 15–30; corolla tube about 1 mm long and limb 1.8–3.0 mm long and 1.5–2.0 mm wide; corolla of tubular florets of disk 1.8–2.5 mm long. Achenes 2.0–2.7 mm long and about 0.6–0.7 mm wide, with 5–8 longitudinal ribs, and more or less irregularly toothed corona 0.3–0.6 mm long. Flowering June to August.

Steppes, stony and rubbly slopes, chalk and limestone outcrops.—*European part:* Middle Dnieper (southern part), Volga-Don (southern part), Trans-Volga (rarely in Kuibyshev Region), Bessarabia, Black Sea Region, Lower Don, Lower Volga (northwestern part), Crimea; *Western Siberia:* Upper Tobol (southern part, rarely); *Caucasus:* Ciscaucasia, Dagestan (northern part); *Soviet Central Asia:* Aralo-Caspian Region (northern part, rarely). Endemic. Described from garden specimen of unknown origin, probably from the south of the European part of the USSR. Probably the Gmelin drawing cited above is the type specimen.

Note. Judging from the original description, *Pyrethrum baumanii* Stev., described from Crimea (prope Ursuf. Baumann), belongs to this species; I did not see its type.

24. **T. paczoskii** (Zefir.) Tzvel. comb. nova.—*Pyrethrum discoideum* MB. in herb. non Ldb.—*P. paczoskii* Zefir. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1957) 255.—*P. achilleifolium* ssp. *wisockianum* Pacz. ex Zefir. l. c. in syn.

350 Perennial. Plant 15–40 cm high, with short, creeping, more or less branched rhizome, with sparse bifid (mixed with simple) hairs. Stems few or solitary, erect, sparsely leafy, more or less branched above, short-appressed-hairy to subglabrous. Leaves green or dull green, more or less sparsely hairy to completely glabrous (but younger leaves always hairy), with numerous punctate glands; basal leaves up to 10–12 cm long and 1.5(2.0) cm wide, rather long-petiolate, twice pinnately cut, linear, their terminal lobes lanceolate-ovate to linear-lanceolate, up to 1.5 mm long, short-acuminate; middle and upper cauline leaves strongly reduced, sessile. Capitula (2)5–15(20), on peduncles 0.5–5.0 cm long, in lax, not always regular, corymbose inflorescence. Involucres 5–9 mm in dia and 4–5 mm long, usually subglabrous; involucre bracts coriaceous-herbaceous, outer broadly ovate, subacute, inner oblong-lanceolate, 1.5–2 times as long as outer; all bracts with rather wide, light-colored, membranous border but wider in inner bracts and appendiculately broadened at apex. Peripheral pistillate florets ligulate, yellow, 20–30, but usually fewer, some transitional to tubular, sometimes all florets tubular; corolla of ligulate florets (if present) with tube about 1 mm long and ligule 1–2 mm long and 1.0–1.5 mm wide; corolla of tubular florets of disk 1.8–2.4 mm long. Achenes 1.5–2.0 mm long and about 0.6 mm wide, with 5–6 longitudinal ribs and more or less irregularly toothed, corona about 0.3 mm long. Flowering June to July.

Stony and rubbly slopes, steppes.—*European part*: Crimea (western part and northern foothills of Yaila). Endemic. Described from Crimea. Type in Leningrad.

25. ***T. ulutavicum*** Tzvel. sp. nova in Addenda, XXVI, 878.

Perennial. Plant 12–25 cm high, with short, creeping, more or less branched rhizome, usually dull green from rather sparse bifid (mixed with simple) hairs. Stems rather numerous, less often solitary, erect or basally ascending, sparsely leafy, simple or branched above middle. Leaves dull green from not so dense pubescence, with inconspicuous punctate glands; basal leaves up to 8 cm long and 1.3 cm wide, rather long-petiolate, pinnatisect, broadly linear; primary segments 5–10 on each side, usually pinnately lobed or parted, their terminal segments or lobes broadly ovate to linear, up to 1.5 mm wide, short-acuminate; cauline leaves strongly reduced, middle and upper sessile; upper leaves usually pinnately parted. Capitula solitary or 2–5 on single stem and then on long (up to 8–10 cm) peduncles, in lax, often irregular, 351 corymbose inflorescence. Involucres 6–11 mm in dia and 4.5–6.0 mm long, weakly hairy; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, inner 1.5–2 times as long as outer, oblong-lanceolate;

all bracts with rather wide, light colored membranous border but in inner bracts appendiculately broadened at apex. Peripheral pistillate florets more or less transitional from tubular to ligulate, true ligulate florets usually absent; corolla of tubular florets of disk 2–3 mm long. Achenes 1.8–2.5 mm long and about 0.6 mm wide, with 6–9 longitudinal ribs and irregularly toothed corona about 0.3 mm long. Flowering June to July.

Rocks, stony slopes.—*Soviet Central Asia*: Aralo-Caspian Region (Ulutau Mountains). Endemic. Described from the Ulutau Mountains. Type (Karaganda Region, central part of Karsakpai District, slope of the Kazan-Tau Mountain, 12 km south of Ulutavskii, 12.VII.1929, No. 298, N. Shipchinsky) in Leningrad.

Note. Despite some superficial similarity (first of all, the absence of true ligulate florets) to species of series *Santolia*, the structure of the involucre indicates very close affinity of this species with *T. achilleifolium* and *T. millefolium*, in relation to which it is a narrowly endemic race confined to rocky and stony habitats.

26. **T. achilleifolium** (MB.) Sch. Bip. Tanacet. (1844) 47.—*Pyrethrum achilleifolium* MB. Fl. taur.-cauc. II (1808) 327 and III (1819) 580; DC. Prodr. VI, 58; Ldb. Fl. Ross. II, 554; Grossh. Fl. Kavk. IV, 135 and Opred. Rast. Kavk. (1949) 459; Kryl. Fl. Zap. Sib. XI, 2752.—*P. millefoliatum* var. *achilleifolium* (MB.) O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 189.—*Gymnocline achilleifolia* (MB.) C. Koch in Linnaea, XXIV (1851) 340.—*Chrysanthemum achilleifolium* (MB.) Kuntze in Tr. Peterb. Bot. Sada, X (1887) 202; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI (1936) 347.—*C. millefoliatum* var. *achilleifolium* (MB.) Schmalh. Fl. Yugo-Zap. Ross. (1886) 299 and Fl. II (1897) 70; Kryl. Fl. Alt. III (1904) 622.—**Ic.**: Gmel. Fl. Sib. II (1749) t. 86, fig. 2; Krasch. op. cit. 247, Fig. 682.

Perennial. Plant (8)10–35(40) cm high, with short, creeping, more or less branched rhizome, more or less grayish green from rather profuse lax pubescence of appressed bifid (mixed with simple) hairs. Stems rather numerous, less often solitary, erect or basally ascending, sparsely leafy, more or less branched above middle. Leaves grayish-green from rather profuse pubescence, with numerous punctate glands; basal leaves up to 10(15) cm long and 1.3(1.5) cm wide, rather long-petiolate, twice pinnately cut, linear, their terminal lobes lanceolate-ovate to lanceolate-linear, up to 1 mm wide, long- or short-acuminate; cauline leaves reduced, upper and middle sessile. Capitula (1)3–12(15), on relatively long (0.5–8.0 cm) peduncles, in lax or somewhat lax, not always regular, corymbose inflorescence. Involucre 4–7 mm in dia and 3.0–4.5 mm long, sparsely hairy mainly at base; involucre bracts

coriaceous-herbaceous, outer lanceolate-ovate, subobtusate, inner 1.5–2 times as long as outer, oblong-lanceolate; all bracts with rather wide, light colored, membranous border, in inner bracts more or less broadened at apex. Peripheral pistillate florets usually ligulate, yellow, 5–20, limb 1–2 mm long and 1–2 mm wide and tube about 0.8–1.0 mm long, less often transitional from tubular to ligulate; corollas of tubular florets of disk 1.5–2.2 mm long. Achenes 1.5–2.0 mm long and 0.3–0.5 mm wide, with 5–8 longitudinal ribs and irregularly toothed, corona 0.3–0.5 mm long. Flowering June to July.

Solonetzcic steppes, solonetzcies.—*European part*: Trans-Volga (southern part), Black Sea Region (southern part), Lower Don, Lower Volga, Crimea (northern part); *Western Siberia*: Upper Tobol (southern part), Irtysh (southern part; rarely), Altai (western foothills; rarely); Caucasus: Ciscaucasia, Dagestan (northern part); *Soviet Central Asia*: Aralo-Caspian Region (northern and eastern parts), Lake Balkhash Region (northern part). *General distribution*: Romania. Described from Ciscaucasia. Type in Leningrad.

Note. In relation to *T. millefolium** it is a very close, more ecological, than geographical race, confined more or less to "solonetzcic" [alkaline], clayey or slightly stony parts of the steppe and semideserts. Specimens intermediate between both these species are not uncommon under transitional habitat conditions.

Series 9. Chiliophylla Tzvel.—Capitula with developed ligulate florets, (1)2–10(12), in compact or lax regular corymbose inflorescence. Involucres 4–9 mm in dia; outer involucral bracts ovate or ovate-lanceolate, with rather wide, light colored or brownish, membranous border. Receptacle strongly or moderately convex. Herbaceous plants with twice pinnately cut leaves having shorter and more obtuse terminal lobes than in species of previous series.

27. ***T. chiliophyllum*** (F. and M.) Sch. Bip. Tanacet. (1844) 47.—*T. kochii* Sch. Bip. *ibid.*—*Pyrethrum chiliophyllum* F. and M. in DC. Prodr. VI (1837) 59; Ldb. Fl. Ross. II, 555; Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 48, descr. emend.; Grossh. Fl. Kavk. IV, 132 and Opred. Rast. Kavk. 460.—*P. armenum* C. Koch in Linnaea. XVII (1843) 46.—*P. millefolium* auct. non Willd.: Boiss. Fl. or. III, 349 p. p.—*P. cheilanthifolium* Sosn. in Izv. Kavk. Muz. X (1916) 11; Grossh. Fl. Kavk. IV, 132 and Opred. Rast. Kavk. 460.—*P. chiliophyllum* var. *oligocephalum* (DC.) Sosn. op. cit. (1916) 14, quoad pl.; Grossh. Fl.

*Should read *T. millefolium*.—Sci. Ed.

Kavk. IV, 132.—*P. transcaasicum* Sosn. in Tr. Azerb. Otd. Zakavk. Fil. Akad. Nauk SSSR, Bot. I (1933) 46; Grossh. Fl. Kavk. IV < 132 and Opred. Rast. Kavk. 459.—*Gymnocline chiliophylla* (F. and M.) C. Koch in Linnaea, XXIV (1851) 339.—*G. armena* (C. Koch) C. Koch op. cit. (1851) 340.—*Chrysanthemum transcaasicum* (Sosn.) Bornm. in Fedde, Repert. XXXVI (1934) 350.

Perennial. Plant (6)10–35(50) cm high, with short, creeping, more or less branched rhizome, grayish from profuse fine tomentum of appressed bifid and simple hairs. Stems few, less often solitary, erect or basally ascending, sparsely leafy, more or less branched at apex. Leaves grayish-green from profuse fine tomentum, with inconspicuous punctate glands; basal leaves up to 10(15) cm long and 2.5(3.0) cm wide, rather long-petiolate, twice pinnately cut, somewhat oblong to broadly linear their second order segments often lobed or divided, terminal lobes and segments almost sub-orbicular to oblong, up to 1.5 mm wide, obtuse but often with very short cusp; cauline leaves much smaller and less divided, middle and upper sessile. Capitula (1)3–10(12), on relatively short (0.4–5.0 cm) peduncles, in rather compact, regularly corymbose inflorescence. Involucres 4.5–9.0 mm in dia and 3.5–5.0 mm long, more or less appressed-hairy; involucral bracts coriaceous-herbaceous, outer ovate, sub-obtuse, inner oblong-linear, 1.5–2 times as long as outer, all bracts with wide, light-colored or brownish, membranous border, in inner bracts appendiculately broadened at apex. Peripheral pistillate florets ligulate, yellow, 10–25, corolla tube 1.2–1.6 mm long and limb (1.5)2.0–4.0(5.0) mm long 1–3 mm wide; corolla of tubular florets of disk 1.6–2.4 mm long. Achenes 1.5–2.0 mm long and about 0.5 mm wide, with 5–8 longitudinal veins and irregularly toothed (or lobed), corona 0.1–0.3 mm long. Flowering June to August.

Stony and rubbly slopes, steppes to middle mountain zone.—*Caucasus*: Dagestan (southern part), Eastern and Southern Transcaucasia, Talysh. *General distribution*: Turkey (northeastern part), Iran-Afghanistan (northwestern part). Described from Southern Transcaucasia (“Karabakh”). Type and isotypes in Leningrad.

Note. A highly polymorphic species, probably divisible into many narrow endemic (local) races differentiated by the size of the capitula, length of their peduncles, size of the limb [ligule] in the ligulate florets (specimens with particularly large ligulate florets are found in southern Dagestan and in the region of Lake Sevan), and so on. Nevertheless, I consider it possible for the time being to retain as synonyms of this species such later described species as *Pyrethrum armenum* C. Koch, *P. cheilanthisfolium* Sosn. and *P. transcaasicum* Sosn. The first two of these were described from northeastern Turkey near its border with

the Armenian SSR, and, in my opinion, do not differ significantly from the type specimens of *Tanacetum chiliophyllum*. The third species was described from very small specimens collected by M. Sakhokiya in the Geokchai District of the Azerbaidzhan SSR, apparently in places subjected to intense cattle grazing (there are also larger specimens of
 354 *T. chiliophyllum* from this same area). Specimens with a brownish membranous border of the involucre bracts are found about equally often in the mountains of the Lesser Caucasus as in the foothills of the Greater Caucasus, although it is not ruled out, all the same, that they form a very weakly differentiated, higher-mountain race of the series *Chiliophylla*.

28. **T. longipedunculatum** (Sosn.) Tzvel. comb. nova.—*Pyrethrum longipedunculatum* Sosn. in Zam. po Sist. i. Geogr. Rast. Bot. Inst. Akad. Nauk Gruz. SSR, XV (1949) 6; Grossh. Opred. Rast. Kavk. 459.

Perennial. Plant 25–50 cm high, with short, creeping, more or less branched rhizome, grayish from profuse, appressed, bifid and simple hairs. Stems few, less often solitary, erect, sparsely leafy, more or less branched at apex. Leaves as in previous species. Capitula (3)5–10(12), on rather long (1.5–12 cm), arcuate peduncles, in lax but regular corymbose inflorescence. Involucres 4–5 mm in dia and 3–4 mm long, at base profusely hairy; involucre bracts coriaceous-herbaceous, outer ones ovate-lanceolate, with narrow membranous border, inner ones oblong-linear, 1.5–2 times as long as outer, with wide, light colored, membranous border, appendiculately broadened at apex. Peripheral pistillate florets ligulate, yellow, 5–15, corolla tube 1.2–18.0 mm long and limb 1.8–2.5 mm long and 1–1.5 mm wide; corolla of tubular florets of disk 2–2.5 mm long. Achenes 1.5–2.2 mm long and about 0.5 mm wide, with 5–7 longitudinal ribs and corona 0.1–0.2 mm long, obtusely and irregularly lobed almost up to base. Flowering June to July.

Stony and rubbly slopes of lower mountain zone.—*Caucasus*: Southern Transcaucasia (Nakhichevan ASSR). Endemic. Described from Nakhichevan ASSR. Type in Tbilisi; isotypes in Leningrad.

29. **T. oligocephalum** (DC.) Sch. Bip. Tanacet. (1844) 48.—*Pyrethrum oligocephalum* DC. Prodr. VII (1838) 297.—*P. millefoliatum* var. *oligocephalum* (DC.) Boiss. Fl. or. III (1875) 349.—*P. chiliophyllum* var. *oligocephalum* (DC.) Sosn. in Izv. Kavk. Muz. X (1916) 14, quoad nom.—*P. sosnowskyanum* Grossh. Fl. Kavk. IV (1934) 132, Diagnosis in Russian, and Opred. Rast. Kavk. (1949) 460.

Perennial. Plant 20–40 cm high, with short, creeping, more or less branched rhizome, grayish-green from profuse pubescence of appressed

bifid and simple hairs. Stems few, less often solitary, erect, sparsely leafy, simple or with few lateral branches in upper part. Leaves as in previous species. Capitulum solitary or 2 or 3 on a single stem, on rather long, up to 6(10) cm peduncles. Involucres 7–9 mm in dia and 5–6 mm long; involucre bracts as in previous species. Peripheral pistillate florets ligulate, yellow, corolla tube 1.2–1.8 mm long and limb 2–4 mm long; corolla of tubular florets of disk 1.5–2.4 mm long.

355 Achenes 1.5–2.5 mm long and about 0.6 mm wide, with 5–8 longitudinal veins [ribs] and irregularly toothed, corona about 0.2 mm long. Flowering June to July.

Stony slopes and rocks in middle mountain zone.—*Caucasus*: Southern Transcaucasia (Daralgez). *General distribution*: Armenia and Kurdistan. Described from Turkey. Type in Geneva.

Note. Despite the complete similarity of their original descriptions, it is not ruled out that *Pyrethrum oligocephalum* DC. and *P. sosnowskyanum* Sosn. are not entirely identical. I did not see the type specimens of both these species.

Series 10. Dumosa Tzvel.—Capitula lacking true ligulate florets, solitary (but numerous on a plant). Involucre 5.5–7.5 mm in dia; outer involucre bracts lanceolate-ovate, with rather wide, light colored, membranous border. Receptacle moderately convex. Plants more or less woody at base, with pinnately cut leaves.

30. **T. tenuissimum** (Trautv.) Grossh. Opred. Rast. Kavk. (1949) 462.—*Pyrethrum tenuissimum* Trautv. in Tr. Peterb. Bot. Sada, IX, 1 (1884) 392; Grossh. Fl. Kavk. IV < 129.—*P. dumosum* auct. non Boiss.: Lipsky in Tr. Peterb. Bot. Sada, XIII (1894) 306 and Fl. Kavk. (1899) 349; Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 42 p. p.—*P. tabrisianum* auct. non Boiss.: Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 84.—*Chrysanthemum tenuissimum* (Trautv.) Winkl. in Tr. Peterb. Bot. Sada, XI (1889) 123; B. Fedtsch. Rast. Turk. 737.

Perennial. Plant 15–40 cm high, with thick, many-branched rhizome, grayish-green from rather profuse pubescence of bifid and simple hairs. Stems numerous, branched only at woody base, erect or more or less arcuately bent, very sparsely leafy (almost virgate). Leaves grayish from rather profuse pubescence, with rather numerous punctate glands; basal and lower cauline leaves up to 5(8) cm long and 1 cm wide, with rather long petioles thickened at base, pinnately cut, broadly linear, their primary segments 5–10 on each side, more or less pinnately lobed, sometimes all or some entire, terminal segments and lobes up to 1.5 mm wide, obtuse but usually with very short cusp; middle and upper cauline leaves very small, sessile, pinnately lobed to subentire. Capitula

solitary, but numerous on a plant, on long, slender peduncles. Involucres 5.5–7.5 mm in dia and 4.5–5.5 mm long, more or less appressed-hairy; involucre bracts coriaceous-herbaceous, outer ones lanceolate-ovate, inner ones linearly oblong, 2–3 times as long as outer; all bracts with wide, light colored, membranous border, in inner bracts appendiculately broadened. Peripheral pistillate florets tubular or transitional from tubular to ligulate; corolla of tubular florets of disk 1.8–2.5 mm long. Achenes 1.8–2.3 mm long and about 0.5 mm wide, with 6–10 longitudinal veins [ribs] and corona irregularly sharp toothed, 0.2–0.4 mm long. Flowering June to July (Plate XIV, Fig. 1).

Rocks, stony slopes in lower [mountain] zone.—*Caucasus*: Southern Transcaucasia (southeastern part of Nakhichevan ASSR). *General distribution*: Iran (northeastern part). Described from “Karabakh,” probably from Nakhichevan ASSR. Type in Leningrad.

Note. It is distinguished from the very similar Iranian species *T. dumosum* Boiss. (*Diagn. ser.* 1, 6, 1845, p. 89) by cup-shaped (but not goblet-shaped) involucre with bracts that are quite profusely hairy on the dorsal side and with a membranous border that is considerably narrower at the apex.

Series 11. Uniflora Tzvel.—Capitula with developed ligulate florets, solitary, less often two on single stem. Involucres 8–12 mm in dia; outer involucre bracts lanceolate-ovate, with rather wide, light colored, membranous border. Receptacle weakly or moderately convex. Herbaceous plants with twice pinnately cut leaves.

31. ***T. uniflorum*** (F. and M.) Sch. Bip. Tanacet (1844) 48.—*Pyrethrum uniflorum* (F. and M.) in DC. Prodr. VI (1837) 60; Boiss. Fl. or. III, 349; Sosn. in Izv. Kavk. Muz. X, 11; Grossh. Fl. Kavk. IV, 132 and Oprod. Rast. Kavk. 459.—*P. dumosum* auct. non Boiss.: Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 42, p. p.

Perennial. Plant 15–50 cm high, with thick, many-branched rhizome, grayish-green form rather profuse pubescence of bifid and simple hairs. Stems few or solitary, erect, sparsely leafy, simple. Leaves grayish-green from rather profuse pubescence, with inconspicuous punctate glands; basal and lower cauline leaves up to 10 cm long and 1.5 cm wide, rather long-petiolate, twice pinnately cut, oblong-linear; terminal lobe oblong to broadly-ovate, up to 1.5 mm wide, obtuse but with short cusp; middle and upper cauline leaves strongly reduced and less divided, sessile. Capitula solitary, less often 2 on stem, on long (up to 15 cm) peduncles. Involucres 8–12 mm in dia and 5.5–9.0 mm long, basally somewhat cuneate or obtuse, more or less appressed-hairy; involucre bracts coriaceous-herbaceous, outer ones lanceolate-ovate,

inner ones linearly oblong, 2–3 times as long as outer; all bracts with rather wide, light-colored, membranous border but at apex appendiculately broadened in inner bracts. Peripheral pistillate florets ligulate, yellow, corolla tube 1.8–2.5 mm long and limb 5–10 mm long and 1.5–3.5 mm wide; tubular florets of disk 2.6–3.5 mm long. Achenes 2.6–3.5 mm long and about 0.6 mm wide, with 8–12 longitudinal ribs and corona irregularly toothed or lobed, 0.2–0.4 mm long. Flowering
357 May to July.

Stony and rubbly slopes, rocks in lower mountain zone.—*Caucasus*: Southern Transcaucasia (mainly in Nakhichevan ASSR). *General distribution*: Iran (northwestern part). Described from Iran. Type and isotypes in Leningrad.

Note. Apparently, it is divisible into several narrowly endemic, ecogeographical races differentiated mainly by the size of the capitula and the length of the ligulate florets. In the USSR, plants with capitula smaller than in the type specimens predominate, sometimes with two on the same stem.

Series 12. Integrifolia Sosn. in Tr. Tifl. Bot. Sada, XVII (1915) 39.—Capitula with developed ligulate florets, solitary. Involucres 4.5–7.0 mm in dia; outer involucral bracts lanceolate-ovate, with very narrow, brownish, membranous border. Receptacle weakly convex. Herbaceous plants with pinnately lobed leaves.

32. *T. akinfievii* (Alex.) Tzvel. comb. nova.—*Pyrethrum akinfiewii* Alexenko in Tr. Tifl. Bot. Sada, VI, 1 (1902) 58; Sosn. in Tr. Tifl. Bot. Sada, XVII, 39; Grossh. Fl. Kavk. IV, 131 and Opred. Rast. Kavk. 459.

Perennial. Plant 6–30 cm high, with thick, many-branched rhizome, silky-grayish from, fine appressed tomentum of bifid and simple hairs. Stems usually rather numerous, less often solitary, erect or basally ascending, sparsely leafy, simple. Leaves silky-grayish from profuse pubescence, with inconspicuous punctate glands; basal leaves up to 10 cm long and 8 mm wide, with rather long petiole thickened at base, uniformly pinnately lobed, broadly linear, lobes 8–20 on each side, entire, obtuse or subobtuse; cauline leaves strongly reduced, basally cuneately narrowed, blunt-toothed to entire. Capitula solitary (but rather numerous on our plant), with very long (up to 15 cm) peduncles. Involucres 4.5–7.0 mm in dia and 6.0–8.5 mm long, more or less appressed-hairy; involucral bracts coriaceous-herbaceous, outer ones lanceolate-ovate, subacute, with very narrow brownish, membranous border, inner ones oblong-linear, 1.5–2.5 times as long as outer, with wider membranous border, apically appendiculately broadened. Peripheral pistillate florets ligulate, orange-yellow, 8–20, with corolla

tube about 1.5 mm long and limb 6–11 mm long and 2.5–4.5 mm wide; corolla of tubular florets of disk 2.4–3.0 mm long. Achenes 2.4–3.0 mm long and about 0.7–0.8 mm wide, with 8–12 longitudinal ribs, corona 0.1–0.2 mm long, irregularly blunt-toothed almost to base. Flowering July to August (Plate XIV, Fig. 2).

Calcareous rocks at 1,000–2,000 m.—*Caucasus*: Dagestan. Endemic. Described from Dagestan ASSR. Type and isotype in Leningrad.

- 358 **Note.** This narrowly endemic species, so far known only from the type locality (near the village of Tsudakhar), does not show close affinity with the other Caucasian species of the genus and, possibly, deserves to be separated into its own section. Among the introduced species, probably the Turkish species *Pyrethrum pectinatum* Hausskn. [in Mittheil. Thuring. Bot. Ver. N. Folge, XVI (1901) 18] is close to it, which, according to the original description also has yellow ligulate florets and slightly divided leaves.

Section 4. *Asterotricha* Tzvel. sect. nova in Addenda XXV, 878.—Profusely pubescent with more or less appressed stellate hairs, plants 5–30 cm high, always with short nonflowering branches and relatively sparsely leafy stems. Capitula solitary, always with ligulate florets. Involucres narrow-goblet-shaped, 3.5–10.0 mm in dia; outer involucre bracts a third to a half as long as inner bracts. Receptacle almost flat, punctate-tuberculate. Achenes 2.0–3.2 mm long, with 5–6 distinct, longitudinal ribs and irregularly obtusely lobed, corona 0.2–0.3 mm long.

Type of section: *Tanacetum walteri* (Winkl.) Tzvel.

Note. Besides the two species described below, this section also includes *T. khorassanicum* (Krasch.) Tzvel. comb. nova [= *Pyrethrum khorassanicum* Krasch. in Fedde, Repert. XXVI (1928) 27] from northeastern Iran. All the species are closely related ecogeographical races.

33. ***T. turcomanicum*** (Krasch.) Tzvel. comb. nova.—*Pyrethrum turcomanicum* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 158.—**Ic.:** Krasch. ibid. 159, fig. 2.

Perennial. Plant 10–30 cm high, with thick, many-branched rhizome, grayish-green from profuse pubescence of appressed stellate hairs. Stems usually rather numerous, less often solitary, erect or basally ascending, sparsely leafy, more or less branched only at base, less often with 1–2 branches arising from axil of upper leaves. Leaves grayish-green from profuse pubescence, with inconspicuous punctate glands; basal and lower cauline leaves up to 5 cm long and 1 cm wide,

with rather long petiole thickened at base, twice pinnately cut, oblong-linear; their primary segments 5–10 on each side, sometimes pinnately lobed; terminal lobes lanceolate-ovate to oblong-lanceolate, up to 1 mm wide, somewhat thick, obtuse but usually with short cusp; middle and upper cauline leaves strongly reduced and less divided, sessile or subsessile. Capitula solitary (but usually numerous on a plant), sometimes two or three (but usually numerous on plant) on single stem; peduncles up to 10(15) cm long. Involucres 3.5–6.0 mm in dia and 5.0–6.5 mm long, more or less hairy; involucre bracts coriaceous-herbaceous, outer lanceolate-ovate, subacute, inner broadly linear, 2–3 times as long as outer, all bracts with relatively narrow, blackish-brown, membranous border, but apically broadened in inner bracts as small, usually more or less fimbriate appendage. Peripheral pistillate florets ligulate, yellow, 2–8 with corolla tube 1.0–1.4 mm long and limb 1.5–2.5 mm long and about 1 mm wide; corolla of tubular florets of disk 2.5–3.5 mm long. Achenes 2.6–3.2 mm long and about 0.9 mm wide, with 5 less often 6 longitudinal ribs and corona obtusely lobed, about 0.3 mm long. Flowering June to July.

Stony and rubbly slopes at 1,500–2,000 m.—*Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Iran-Afghanistan (Kopetdag). Described from Kopetdag (near Ashkhabad). Type and isotypes in Leningrad.

34. **T. walteri** (Winkl.) Tzvel. comb. nova.—*Chrysanthemum walteri* Winkl. in Tr. Peterb. Bot. Sada, XI (1889) 123.—*Pyrethrum walteri* (Winkl.) B. Fedtsch. in O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 189.—*lc.*: Winkl. op. cit. t. 3.—*Exs.*: GRF No. 3266.

Perennial. Plant 5–20 cm high, with thick, many-branched rhizome, grayish-green from rather profuse pubescence of appressed stellate hairs. Stems usually quite numerous, less often solitary, erect, sparsely leafy, more or less branched only at base. Leaves as in previous species; basal leaves up to 4 cm long and 1.2 cm wide, with much shorter (in comparison with width) lamina, primary segments 3–6 on each side. Capitula solitary (but usually numerous on a plant), peduncles up to 6–7 cm long. Involucres 6–10 mm wide and 5.5–7.0 mm long, profusely hairy; involucre bracts as in previous species. Peripheral pistillate florets ligulate, yellow, 8–16; corolla tube about 1.2 mm long and limb 3.0–3.5 mm long and 1.2–1.5 mm wide; corolla of tubular floret of disk 2.4–3.2 mm long. Achenes 2.0–2.6 mm long and about 0.7 mm wide, with 5 less often 6, longitudinal ribs and irregularly blunt-toothed, corona 0.2–0.3 mm long. Flowering June to July.

Rocks, stony slopes at 1,800–3,000 m.—*Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Iran-Afghanistan (Kopetdag). Described from Kopetdag. Type in Leningrad.

Note. In relation to the previous species, it is a higher-mountain, mainly saxicolous race.

GENUS 1539. *Hemipappus* C. Koch^{1,2}

C. Koch, in *Linnaea*, XXIV (1851) 340.

Capitula 5–60, with peduncles up to 6(10) mm long, at apices of stem in very compact, simple or compound corymbs, homogamous, 360 with numerous (20–50) bisexual, tubular florets of disk. Involucres goblet-shaped, 3.5–5.5 mm in dia and 4.0–5.5 mm long; involucre bracts coriaceous-herbaceous, imbricate, in 3–4 irregular rows; outer bracts lanceolate, acute, lacking membranous border, inner broadly-linear, subobtusate, 1.5–2 times as long as outer, with narrow, light-colored, membranous border apically broadened into small oval appendage. Receptacle flat, full, more or less covered with sparse hairs (to subglabrous), weakly punctate-tuberculate. Corolla of disk florets yellow, 2.5–3.2 mm long, with tube slightly compressed dorsally, weakly and gradually broadened in upper half, with 5 lanceolate deltoid, curved teeth, a fifth to a fourth as long as tube; stamen filaments thickened in upper part; anthers lacking distinct basal appendage, but with lanceolate-ovate, somewhat obtuse apical appendages, pollen grains globose, spinulose; style [stigma] bifid, with linear, truncate branches. All achenes similar, glabrous, 1.8–2.5 mm long and about 0.6 mm wide, almost terete, narrowing toward base, with 5 relatively weakly raised longitudinal ribs, with pappus as corona 1.2–1.6 mm long, cut dorsally up to or almost to base, unilateral, finely and irregularly toothed throughout. Herbaceous perennials, more or less covered with appressed tomentum of bifid hairs, with oblique, thick rhizome, condensed vegetative shoots (as leaf rosettes), relatively sparsely leafy erect stems, and alternate pinnatipartite or pinnatisect leaves.

Four species of this genus occur in northeastern Turkey and bordering regions of Iran.

Lectotype of genus: *Hemipappus canus* C. Koch.

Note. Differs from the genus *Tanacetum* L. by having homogamous capitula, a sparsely hairy flat receptacle, and a distinctive structure of the pappus. The genus *Hemipappus* C. Koch shows very great, but apparently only superficial, similarity to the genus *Hippolytia*

¹Treatment by N.N. Tzvelev.

²From the Greek words *hemi*—half and *pappus*—tuft; so named because the pappus of the achenes in the species of this genus seems as if cut in half on one side.

Poljak., having, however, achenes that completely lack a pappus, and a receptacle that is glabrous and moderately convex.

1. **H. canus** C. Koch in Linnaea, XXIV (1851) 341.—*Pyrethrum argenteum* var. *tenuisectum* Boiss. Fl. or III (1875) 354; Sosnovskii, in Tr. Tifl. Bot. Sada, XVII (1915) 54; Grossh. Fl. Kavk. IV, 130.—*Chrysanthemum isabellinum* (C. Koch) Rech. f. in Ann. Naturhist. Mus. Wien. LVII (1950) 92, p. p.

Perennial. Plant 15–40 cm high, with thick, oblique rhizome, grayish from profuse appressed tomentum of bifid hairs. Stems solitary or few, erect, simple (but branched in inflorescence), leafy mainly in
 361 lower half. Leaves grayish from profuse tomentum, with inconspicuous punctate glands; basal leaves on condensed vegetative shoots to 8 cm long and 3.5 cm wide, with long (exceeding lamina) petiole thickened at base, more or less ovate to roundish, twice pinnately parted or cut, terminal lobes linear or linear-lanceolate, up to 1.5(2.0) mm wide, subobtusate or with very short cusp; cauline leaves like basal but much smaller, with shorter petiole or sessile. Capitula 10–60, in very compact compound corymb. Involucres 3.5–5.5 mm in dia and 4.0–5.5 mm long, almost completely finely tomentose. Corolla of tubular florets yellow, 2.5–3.2 mm long. Achenes 1.8–2.5 mm long and about 0.6 mm wide; corona unilateral, 1.2–1.6 mm long, dorsally cut almost to base. Flowering June to July.

Stony slopes, rocks; up to middle mountain zone. Found in Artvin District of Turkey near its border with Adzharian ASSR. *General distribution*: Northeastern Turkey. Described from Turkey. Type in Berlin.

Note. In the Armenian SSR we may also find a close species, *H. argenteus* (Lam.) Tzvel. comb. nova (= *Achillea argentea* Lam., *Encycl. meth.* I (1783) 29.—*Tanacetum argenteum* Willd., *Achill.* (1789) 51.—*Hemipappus isabellinus* C. Koch, op. cit. 341.—*Pyrethrum argenteum* (Lam.) Boiss. Fl. or. III (1875) 354, excl. var.—*Chrysanthemum argenteum* (Lam.) Bornm. in *Fedde, Repert.* LXXXIX (1944) 345, non Willd. 1803.—*C. isabellinum* (C. Koch) Rech. f. op. cit. 92 p. p.), which is widely distributed in the bordering regions of Turkey. It differs from *H. canus* by having pinnatisect leaves with much wider, toothed or shallow-lobed segments.

Tanacetum argenteum var. *glabratum* DC. (*Prodr.* VI, 131), described from Lower Volga Region, apparently corresponds to one of the species of section *Xanthoglossa* (DC) Tzvel. of the genus *Tanacetum* L. found there. Unfortunately, the Herbarium of the Botanical Institute of the Academy of Sciences of the USSR does not have type material of this variety. The reported occurrence of *Tanacetum argenteum* Willd. in the Altai (Ldb. Fl. Ross. II, 604) is also erroneous.

GENUS 1540. *Pseudohandelia* Tzvel. Gen. Nov.^{1,2}

Tzvel. in Addenda, XXV, 878.

Capitula 20–100, on up to 1.5 cm long peduncles, at stem apex in compact umbellate compound corymbs, homogamous, with numerous (over 100), bisexual, tubular florets of disk. Involucre wide, goblet-shaped, 6–9 mm in dia and 3–5 mm long; involucre bracts herbaceous; 362 all bracts almost equal, outer and middle ones oblong, with wide, more or less erose-toothed, light colored, membranous border, inner/ones narrower, with considerably narrower membranous border often exceeding outer florets in form of pales. Receptacle strongly convex, conical-hemispherical (sometimes exceeding its width), smooth or with scaly bracts along margin (inner bracts of involucre), punctate-tuberculate with distinct chamber. Corolla of tubular florets of disk yellow, 1.8–2.5 mm long, with very narrow tube, usually not compressed, strongly glandular-papillose, abruptly and strongly campanulately expanded in upper third, with 5 lanceolate-deltoid curved teeth, on eighth to a seventh as long as tube; filaments of stamen apically thickened; anthers lacking distinct basal appendage, but with ovate-lanceolate, sub-obtuse apical appendage; pollen grains globose, spinulose. Style [Stigma] bifid; style branches linear, truncate. All achenes similar, rather strongly glandular-papillose, arcuate, narrow-cylindrical (6–8 times as long as wide), 1.8–2.4 mm long and about 0.3 mm wide, with 4–5 very weakly raised longitudinal veins as ribs, lacking pappus, in pericarp with irregular rows of mucous cells, mucilagenous during soaking. Biennial or perennial, monocarpic plants covered with profuse cobwebby tomentum of simple crisped hairs, with thick tap root, erect simple (branched only in inflorescence) stem, and alternate bipinnatisect leaves, with narrow-linear lobes.

A monotypic genus

Note. The only species of this genus—*Pseudohandelia umbellifera* (Boiss.) Tzvel., on the basis of a whole series of characters cannot be included in any of the known genera of the tribe Anthemideae. For example, it is easily distinguished from the genus *Tanacetum* L. by the complete absence of a pappus, very narrow (compared to length), arcuate achenes covered with glandular papillae, a corolla campanulately widened in the upper third with a very long and narrow tube, a distinctive structure of the involucre, homogamous capitula, not to mention the significant habit differences. These same characters, except the absence of the pappus, distinguish the genus *Pseudohandelia* from the

¹Treatment by N.N. Tzvelev.

²From the Greek word *pseudos*—false, and the generic name *Handelia* Heimerl.; named for the considerable morphological similarity with this genus.

genus *Ajania* Poljak. Perhaps there is the most justification to relate the genus *Pseudohandelia* to the genus *Cancrinia* Kar. and Kir., primarily to the species *C. tadshikorum* (Kudr.) Tzvel. However, it is well distinguished even from this genus by the shape of the achenes, which are entirely devoid of the pappus, and also by the structure of the corolla, receptacle, and involucre. It is no less close to the genus *Handelia* Heimerl., with which its strong similarity is not only external but extends also to the structure of the involucre (its inner bracts are like pales and often extend above the receptacle) and the corolla.

363 In my opinion, the genus *Pseudohandelia* is, as it were, a connecting link between the genera of the tribe Anthemideae having a receptacle that is covered with chaff and genera of this tribe without chaff. This clearly shows the artificiality of dividing the tribe Anthemideae into two groups on the basis of this character, which may be accepted only for the sake of convenience.

1. **P. umbellifera** (Boiss.) Tzvel. comb. nova.—*Tanacetum umbelliferum* Boiss. Diagn. ser. 2, III (1856) 30; O. and B. Fedtsch. Perech. Rast. Turk. IV, 206.—*T. trichophyllum*, Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V (1877) 255.—*Pyrethrum umbelliferum* (Boiss.) Boiss. Fl. or. III (1875) 352.—*P. trichophyllum* (Rgl. and Schmalh.) Bornm. and Sint. in Sinten. Iter transcasp.-pers. 1900–1901, No. 172b.—*Chrysanthemum trichophyllum* (Rgl. and Schmalh.) O. Ktze. in Tr. Peterb. Bot. Sada, X (1887) 202.—*C. umbelliferum* (Boiss.) Hoffm. in Pauls. Pl. coll. in As. Med. and Pers. (1909) 149; B. Fedtsch. Rast. Turk. 738.—*C. floccosum* Kitamura in Acta Phyt. et Geobot. XVII (1957) 34 and Fl. Afghan. (1960) 400.—*Lepidolopsis umbellifera* (Boiss.) Poljak. in Fl. Turkm. VII (1960) 105.—**lc.**: Kitam. op. cit. (1960) 96.—**Exs.**: Ed. Horti Petrop. No. 96; Sinten. l. c.; H.F.A.M. No. 193a, b.

Biennial or perennial. Plant 20–100 cm high, with thick, cordlike root, more or less covered with profuse cobwebby tomentum and usually grayish from it. Stem solitary or few, rather thick, erect, branched only apically (in inflorescence), basally covered with sheaths of old leaves with profuse tomentum in their axils. Leaves grayish from lax cobwebby tomentum, sometimes glabrescent, lacking distinct punctate glands; basal leaves to 25–30 cm long and 5–6 cm wide, withering before flowering or persisting, linear, toward base gradually narrowed into short petiole, twice pinnately cut, with reduced intermediate primary segments, second order segments palmately or pinnately 2–5 parted, at different level than primary segments, giving an impression of whorled arrangement of terminal lobes, latter narrow-linear, somewhat thick, up to 0.6 mm wide, with cartilaginous cusp; cauline leaves like basal,

sessile or with very short petiole, uppermost leaves strongly reduced. Capitula numerous, in compact umbellate compound corymb. Involucres 6–9 mm in dia and 3–5 mm long. Corolla of tubular florets yellow, 1.8–2.5 mm long. Achenes 1.8–2.4 mm long and about 0.3 mm wide, lacking corona. Flowering May to July. (Plate XV).

Stony slopes, sands, gravel beds; up to lower mountain zone.—*Soviet Central Asia*: Lake Balkhash Region (southern part), Tien-Shan, Syr-Darya, Amu-Darya, Pamiro Alai Region, mountainous Turkmenia. *General distribution*: Iran-Afghanistan, Dzhungaria-Kashgaria. Described from Afghanistan. Type in Geneva; isotype in Leningrad.

Note. A comparison of the type material of *Tanacetum trichophyllum* Rgl. and Schmalh. with the isotype of *T. umbelliferum* Boiss. shows a complete lack of differences between these species.

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GENUS 1541. **Dendranthema** (DC.) Des Moul. Emend. Tzvel.^{1,2}

Des Moul. in Act. Soc. Linn. Bord. XX (1853) 561, p. p.—*Pyrethrum* sect. *Dendranthema* DC. Prodr. VI (1837) 62.—*Chrysanthemum* sect. *Pyrethrum* subsect. *Dendranthema* (DC.) Kitam. in Acta Phyt. et. Geobot. IV (1935) 36 and Compos. japon. II (1940) 350 p. p.

Capitula solitary at stem apex and its leafy branches (if present) or more numerous (up to 20), and then in more or less regular, lax, corymbose inflorescence, heterogamous, with 10–30 (in cultivated species often more than 30) pistillate, peripheral, ligulate florets in a single row (in cultivated species often in several rows) and numerous bisexual, tubular florets of disk. Involucres saucer-shaped, (6)8–20(40) mm in dia and 4–10(15) mm long; involucre bracts herbaceous, imbricate, in 3, less often 2–4, irregular rows; outer bracts oblong-ovate to narrowly linear, obtuse or subobtuse, inner oblong to narrowly linear, usually not more than 1.5 times, less often almost 2 times as long as outer; all bracts with more or less wide membranous border. Receptacle strongly convex, almost hemispherical, often weakly conical, full, glabrous, less often (section *Haplophylla*) more or less hairy, very weakly punctate-tuberculate, often distinctly alveolate. Corollas of ligulate florets white, pink or different shades of yellow, with more or less dorsally compressed, narrow-winged or wingless tube, 0.6–3.0 mm long, and oblong or linear limb, 8–30(60) mm long; corolla of tubular florets of disk yellow, 2–3 mm long, tube rather weakly and

¹Treatment by N.N. Tzvelev.

²From the Greek words *dendron*—tree, and *anthemos*—flower; named for the woodiness of the base of stems in some species of this genus.

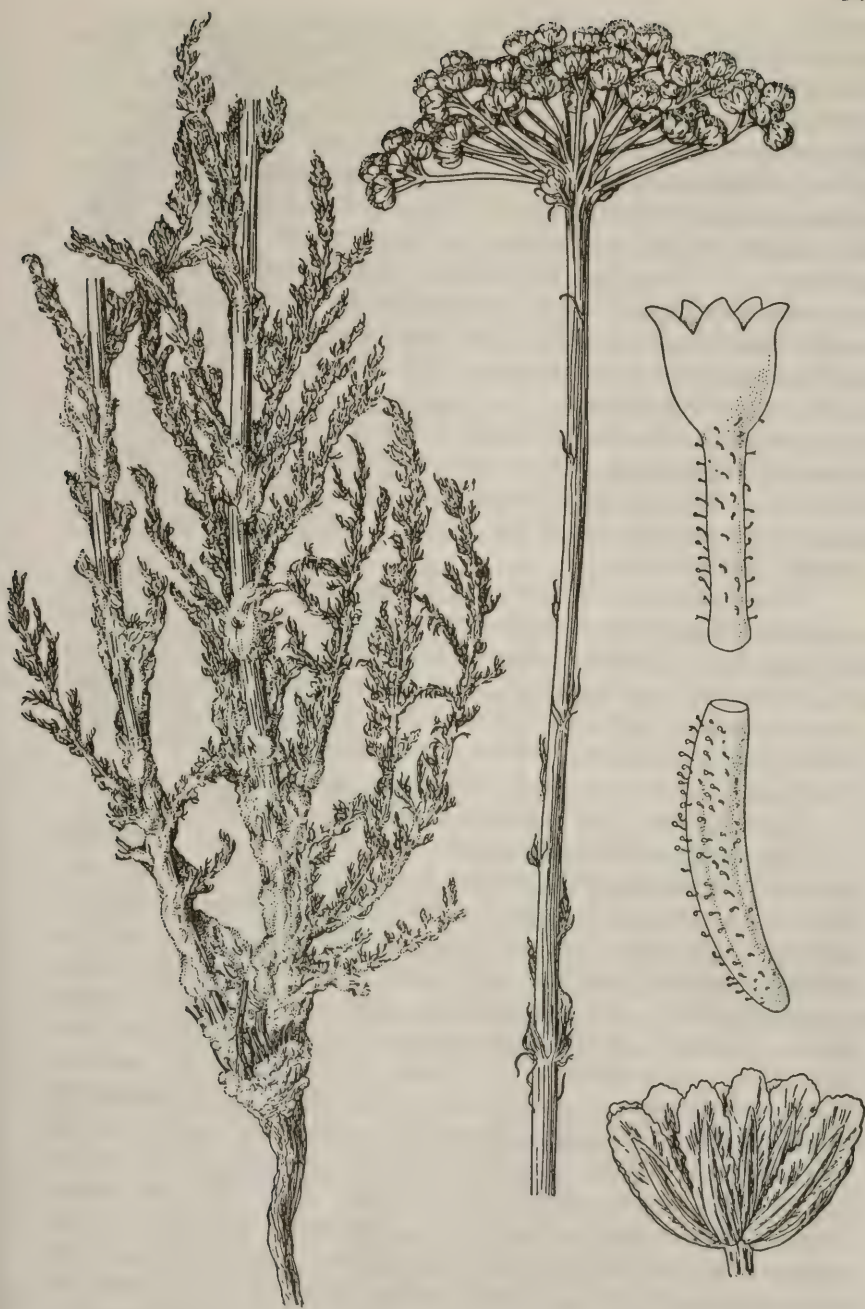


Plate XV.

Pseudohandelia umbellifera (Boiss.) Tzvel., habit, involucre, corolla of tubular florets, achene.

gradually (rather abruptly in section *Haplophylla*) broadened in upper half, with 5 deltoid or lanceolately deltoid, weakly curved teeth, a fifth to a fourth as long as tube; filaments of stamens thickened in upper part; anthers lacking distinct basal appendage, with lanceolate-ovate or oblong, subobtusate or obtuse (roundish) apical appendage; pollen grains globose, spinulose; styles [stigma] bifid, style branches linear, truncate. All achenes similar (in ligulate florets sometimes not developed), glabrous, 1.5–3.0 mm long and about 0.5–0.8 mm wide, almost terete, narrowed toward base, with 6–8 longitudinal veins, very weakly raised as faint ribs, pericarps lacking secretory canaliculi, but usually with muciferous cells in irregular rows almost all over surface of achenes; pappus completely absent.

Perennial herbs, less often half-shrubs, more or less covered with mixed bifid and simple hairs or only simple hairs, sometimes entirely glabrous, with erect (rarely ascending), simple or branched stems and alternate leaves, with more or less incised, lobed, or rarely entire blades (section *Haplophylla*).

The approximately 50 species of this genus are distributed mainly in China, Japan, Korea, Mongolia, and the regions of the Soviet Union bordering these countries; a few of them are found in the arctic regions of all [the northern] continents, and only one species is distributed very sporadically in the vast Eurasian area, extending far to the west, reaching the Carpathians. Fifteen species have been recorded in the USSR; two of these are found only under cultivation.

Type of genus: *Dendranthema indicum* (L.) Des Moul.

Note. Many species of this genus, including the widely distributed species *D. zawadskii*, were referred by De Candolle (*Prodromus*, VI, 1837) and Ledebour (*Fl. Ross.* II, 1845–1846), and following them by most of the authors of the later floras and identification manuals for different regions of the USSR, to the genus *Leucanthemum* Mill., whose species also have achenes without any pappus at least in the tubular florets. However, in all other characters, both morphological and anatomical, the achenes in the genus *Dendranthema* are entirely different from those in *Leucanthemum*, as quite correctly noted by Pawlowsky (B. Pawlowsky, *Ochronie Przyrody*, 1934, p. 14, and *Fl. Polon.* exs. No. 272), who transferred *D. zawadskii* to the genus *Tanacetum* L. after combining *Pyrethrum* Zinn. with the latter. Pawlowsky paid attention also to the considerable differences in the achenes of *D. zawadskii* from all other species of the genus *Tanacetum* L. (complete absence of pappus, weakly developed ribs, presence of muciferous cells in pericarp), indicating that it possibly belongs to a separate, new genus. Moreover, *D. zawadskii*, with a whole series of related species, quite closely borders on the widely cultivated

ornamental chrysanthemums, *D. indicum* and *D. morifolium* (= *D. sinense*), which were already segregated by De Candolle, based on incidental morphological peculiarities partly arising in cultivation, into the separate section *Dendrathema* of the genus *Pyrethrum*, which was later elevated to the rank of genus. Since *D. indicum* is the type species of this genus, we considered it necessary to retain the generic name *Dendranthema* for the whole, broad group of species that border on *D. zawadskii* and *D. indicum*, despite considerable changes in the circumscription of this genus and its characterization. In the accepted circumscription, this genus occupies a rather independent position in the tribe Anthemideae, showing quite clear and close affinity only to the genera *Brachanthemum* DC., *Ajanía* P. Pol. and *Tridactylina* (DC.) Sch. Bip. The extremely interrupted range of the most widely distributed species, *D. zawadskii*, and the concentration of most of the species of the genus in the countries of Southeast Asia, generally rich with relicts, undoubtedly speak of the considerable, though relative, antiquity of the genus *Dendranthema*. The genus is divided into three natural sections, phylogenetically related to each other, which could, however, be considered as separate genera.

Economic Importance. Two species of the genus—*D. indicum* (L.) Des. Moul. and *D. morifolium* (Ramat.) Tzvel.—have long been cultivated as ornamental plants; many other species deserve to be introduced into cultivation.

1. Leaves undivided and entire, narrow-linear. Arctic plants, up to 15 cm high (sect. *Haplophylla*) 13. **D. integrifolium** (Richards.) Tzvel.
- + Leaves more or less lobed, divided, or incised 2.
2. Apical appendages of anthers oblong, obtuse, broadly roundish; achenes not becoming slippery on soaking; rhizome thick, fleshy. Plants of coastal areas (sect. *Arctanthemum*) 3.
- + Apical appendages of anthers lanceolate-ovate, subobtuse; achenes becoming slippery on soaking; rhizome not fleshy (sect. *Dendeanthema*) 5.
3. Plants up to 15(20) cm high; basal leaves at apex 3-, very rarely 5-lobed with subobtuse lobes; cauline leaves shallow 3-lobed at apex to undivided and entire; stems simple. Arctic plants 12. **D. hultenii** A. and D. Löve.
- + Plants up to 30(35) cm high; basal leaves with 3- to 7-lobed or divided lamina (if lobes 3, then usually with distinct wide teeth); cauline leaves undivided and entire; stems simple or branched. Plants of the Pacific Coastal Region 4.
4. All or most basal leaves reniform to roundish, near base more or less strongly truncate or weakly cordate and only at very base

- cuneately decurrent on petiole; involuclral bracts with relatively narrow, usually brownish membranous border 10. **D. kurilense** Tzvel.
- + Basal leaves oblong to almost roundish, always with broad, cuneate base; involuclral bracts with wider, usually blackish-brown membranous border 11. **D. arcticum** (L.) Tzvel.
5. Ornamental plants, usually with "double" capitula (all or some tubular florets modified into ligulate florets) and ligulate florets of various colors 6.
- 369 + Wild plants with white or pink ligulate florets in a single whorl..7.
6. Capitula 2.5–4.0(5.0) cm wide; involuclres 8–20 mm in dia; ligulate florets usually (in typical form) yellow, less often (in hybrid varieties) of other color ***D. indicum** (L.) Des Moul.
- + Capitula 5–15 cm wide; involuclres 2–4 cm in dia; ligulate florets of various colors, very rarely yellow ***D. morifolium** (Ramat.) Tzvel.
7. Leaves whitish- or grayish-tomentose beneath. Half-shrubs 1. **D. sinuatum** (Ldb.) Tzvel.
- + Leaves glabrous or sparsely hairy beneath, sometimes loosely tomentose on both sides. Herbaceous plants 8.
8. Basal and lower cauline leaves usually not more than to middle (less often slightly more), pinnately or palmately lobed, with broadly ovate or oblong, more or less toothed lobes 9.
- + Basal and lower cauline leaves to deeper than middle (usually up to narrowly winged rachis), pinnately or palmately divided or cut, with narrower, linear or oblong-linear usually more or less incised segments 10.
9. Basal and lower cauline leaves reniform to broadly ovate, near base truncate or weakly cordate and only at very base cuneately decurrent on petiole; stems near base more or less ascending, less often erect. 2. **D. erubescens** (Stapf) Tzvel.
- + Basal and lower cauline leaves ovate to suborbicular always with broad, cuneate base; stem usually erect 3. **D. naktongense** (Nakai) Tzvel.
10. Plant up to 20 cm high; stems thick, leafy, almost always strongly branched near base, with short spreading branches bearing capitula; leaves somewhat fleshy. Plants of coastal areas 9. **D. littorale** (Maekawa) Tzvel.
- + Usually taller plants, with thinner stem; simple or branched (above middle); leaves thin 11.
11. Lobes of basal leaves relatively broad (up to 3 mm wide), short-acuminate; on the average, leaves less incised. Widely distributed species, absent in the Pacific Coastal Territory and Sakhalin Island 12.

- + Lobes of basal leaves narrower (up to 1.5, less often 2.0 mm wide), long-acuminate; on the average, leaves more incised. Primorsk Territory and Sakhalin Island 13.
- 370 12. Involucral bracts with wide, blackish-brown, membranous border; peduncles more or less tomentose. Arctic and alpine plants 5. **D. mongolicum** (Ling) Tzvel.
- + Involucral bracts with light colored or brownish membranous border; peduncles more or less hairy but usually not tomentose. Plants of plains and lower mountains 4. **D. zawadskii** (Herb.) Tzvel.
- 13. Plant grayish from loose tomentum; involucral bracts with wide, blackish-brown membranous border 7. **D. sichotense** Tzvel.
- + Plant green, weakly hairy, often subglabrous; involucral bracts with narrower, brownish membranous border 14.
- 14. Ligulate florets pink or pinkish-white; leaves, on the average, with broader lobes. Sakhalin 8. **D. weyrichii** (Maxim.) Tzvel.
- + Ligulate florets white, less often with pinkish shade; leaves, on the average, with narrower lobes. Pacific Coastal Territory 6. **D. maximowiczii** (Kom.) Tzvel.

Section 1. Dendranthema.—Apical appendage of anthers lanceolate-ovate, subobtuse. Receptacle glabrous. Achenes becoming slippery when soaked, with muciferous cells in pericarp. Plants with thin or some what thick but not fleshy rhizome, and leaves with more or less lobed or incised lamina; pubescence of bifid and simple hairs.

Type of section: type of genus.

Series 1. Sinuata Tzvel.—Half shrubs with leaves green above and whitish- or grayish-tomentose beneath; ligulate florets pink or white.

1. **D. sinuatum** (Ldb.) Tzvel. comb. nova.—*Chrysanthemum sinuatum* Ldb. Fl. Alt. IV (1833) 118.—*C. absinthiifolium* Fisch. ex DC. Prodr. VI (1837) 46, in syn.—*C. cinerarium* Steph. ex Ldb. Fl. Ross. II (1845-1846) 542, in syn.—*Leucanthemum sinuatum* (Ldb.) DC. Prodr. VI (1837) 46; Ldb. Fl. Ross. II, 542; Kryl. Fl. Zap. Sib. XI, 2742.—*Tanacetum sinuatum* (Ldb.) Sch. Bip. Tanacet. (1844) 35.—**lc.**: Ldb. Ic. pl. Fl. Ross. V (1834) t. 494.—**Exs.**: GRF No. 3272.

Perennial. Semishrubs, 8–35 cm tall, with thick, woody, many-branched root, more or less covered with fine, appressed tomentum of bifid and simple hairs. Stems woody and strongly branched at base, simple or with few lateral branches above, ascending or erect, densely leafy. Leaves dull green, glabrous or more or less hairy above, with distinct punctate glands, whitish or grayish beneath from fine tomentum; basal and lower cauline leaves with rather long petiole, but occasionally

longer than lamina; lamina rather variable in size and shape, ovate to oblong, pinnately parted or cut, with 2–5 pinnately parted or entire, oblong lobes on each side; terminal lobes oblong or ovate, subobtuse or short-acuminate; upper cauline leaves smaller, usually less incised, with shorter petiole, sometimes with lower lateral lobes close to their base. Capitula solitary at apex of stem and its leafy branches. Involucre 10–18 mm in dia and 5–6 mm long, more or less finely tomentose; involucre bracts with rather wide, blackish-brown, less often brownish membranous border. Ligulate florets pinkish, less often white, with relatively weakly compressed, corolla tube 2–3 mm long and limb 12–25 mm long; corolla of tubular florets 2.5–3.0 mm long, with 5 lanceolate-deltoid teeth. Achenes 2.4–2.8 mm long and about 0.6 mm wide; with 5–6 inconspicuous longitudinal ribs, sometimes extending up to apex of achene as very small teeth. Flowering July to August.

Stony slopes, rocks; in middle and upper mountain zones.—*Western Siberia*: Altai. Endemic. Described from Altai. Type and isotype in Leningrad.

Note. A very well delineated species, possibly deserving separation into its own section. It shows a quite clear, though distant, affinity with *Brachanthemum baranovii* (Krasch. and Poljak.) Krasch. as well as with the groups of unique Central Asian shrubby species of the type of *Pyrethrum roylei* DC. and *Chrysanthemum stoliczkae* Clarke. Possibly, occurs in China and Mongolia; in the east, extends to the western Sayans.

Economic Importance. Deserves introduction into cultivation as an ornamental plant.

Series 2. Indica Tzvel.—Herbaceous plants with more or less deeply pinnately parted leaves, often grayish tomentose beneath; ligulate florets yellow.

***D. indicum** (L.) Des Moul. in Act. Soc. Linn. Bord. XX (1855) 561.—*Chrysanthemum indicum* L. Sp. pl. (1753) 889; Kom. in Tr. Peterb. Bot. Sada, XXV (1907) 644; Stank. in Stank. and Tal. Oprod. Rast. Evrop. Ch. SSSR (1949) 628 p. p.; Grossh. Oprod. Rast. Kavk. 458 p. p.—*Matricaria indica* (L.) Desr. in Lam. Encycl. III (1792) 734.—*Pyrethrum indicum* (L.) Cass. in Dict. Sc. Nat. XLIV (1826) 149; DC. Prodr. VI, 62.—*Tanacetum indicum* (L.) Sch. Bip. Tanacet. (1844) 50.

Perennial. Plant 25–100 cm high, with thick, more or less branched rhizome producing stolon-like underground shoots, dull green or grayish from profuse pubescence of bifid and shorter simple hairs. Stems erect or basally ascending, usually more or less branched, with thin, often

372 flexuous branches, densely leafy. Leaves with numerous, but not always distinct punctate glands, green above, sparsely and short hairy to subglabrous, dull- or grayish-green beneath from rather profuse, often almost tomentose pubescence; basal leaves withering early, cauline leaves up to 6–7 cm long and 4 cm wide, with rather long (1–2 cm), almost wingless, petiole, basally lacking stipules or with pseudostipules (of axillary shoot); their laminae usually oblong-ovate, at base truncate or weakly cordate, deeply pinnatipartite, with larger, obtuse terminal lobe and basally 2 pairs of oblong lateral lobes, more or less lobed or toothed; upper cauline leaves smaller, with shorter petiole, often undivided. Capitula 2.5–4.0(5.0) cm in dia, rather numerous, (1)5–30(50), in lax, compound corymb or corymbose panicle, on thin, more or less hairy, 0.3–5.0 cm long peduncles. Involucres 8–20 mm in dia, and 5–6 mm long, more or less hairy to subglabrous; involucre bracts with rather wide, light-colored or brownish, membranous border, broadened at apex as large round or oval appendage in inner bracts. Ligulate florets yellow, in cultivated varieties often of other colors (pink, white, and others), corolla tube 2.0–2.5 mm long and limb 11–15 mm long; corolla of tubular florets about 3 mm long. Achenes 1.5–2.5 mm long and about 0.5–0.6 mm wide, with 5 very weakly raised, often inconspicuous longitudinal ribs, lacking corona. Flowering August to September.

Cultivated as an ornamental plant, in the south in gardens and parks, in northern regions indoors and in greenhouses.—*General distribution*: China (eastern part), Korea, Japan. Described from garden-grown specimens originating probably from China. Type in London.

Economic Importance. The numerous cultivars of this species widely cultivated under the name of small-flowered or Indian chrysanthemums are mostly hybrids of *D. indicum* with other white- or pink-flowered species. These include many “double” cultivars with all or part of the tubular florets modified into ligulate florets, whose capitula often have a receptacle with scarious bracts along the periphery and strongly reduced inner involucre bracts. The typical wild form of this species with yellow, one-whorled, ligulate florets is found in cultivation relatively rarely.

The “Korean chrysanthemum” also of hybrid origin, with a stem that becomes woody at the base and ligulate florets of various colors from golden-yellow to red and pink, occupies a more or less intermediate position between this species and *D. morifolium*.

Series 3. Sinensia Tzvel.—Herbaceous plants; leaves usually not deeper than to middle (less often slightly more) pinnately or palmately
373 lobed, with broadly ovate or oblong lobes, more or less toothed along margin; ligulate florets white or pink of various shades.

***D. morifolium** (Ramat.) Tzvel. comb. n.—*Chrysanthemum morifolium* Ramat. in Journ. Hist. Nat. II (1792) 240; Kitam. Compos. japon. II, 373.—*C. indicum* auct. non L.: Thunb. Fl. jap. (1784) 320; Stank. in Stank. and Tal. Opred. Rast. Evrop. Ch. SSSR. (1949) 628 p. p.; Grossh. Opred. Rast. Kavk. (1949) 458 p. p.—*C. sinense* Sabine in Trans. Linn. Soc. XIV (1823) 142.—*Pyrethrum sinense* (Sabine) DC. Prodr. VI (1837) 62.—*Tanacetum sinense* (Sabine) Sch. Bip. Tanacet. (1844) 50.—*T. morifolium* (Ramat.) Kitam. op. cit. (1940) 373, nom. alt.—*Dendranthema sinense* (Sabine) Des Moul. in Acta. Soc. Linn. Bord. XX (1855) 562.

Perennial. Plant 25–100 cm high, with thick, sometimes almost woody rhizome producing stolon-like underground shoots, dull green or grayish from profuse pubescence of bifid and shorter simple hairs. Stem erect, more or less branched, woody at base, densely leafy. Leaves with numerous but not always distinct punctate glands, usually dull green above from appressed hairs to subglabrous, more or less grayish beneath from profuse, often almost tomentose pubescence; basal leaves withering early; cauline leaves up to 15 cm long and 8 cm wide, with short or somewhat long petiole, their lamina very variable in shape and extent of incision, oblong-ovate to almost round, pinnately parted or lobed, with more or less approximate, wide segments or lobes. Capitula 5–15 cm in dia, solitary or 2–10 at apex of each leafy branches, on peduncles to 10(15) cm long. Involucres 2–4 cm in dia and 8–15 mm long; outer involucral bracts with relatively narrow, membranous border, inner ones with light-colored or brownish membranous border, apically more or less broadened like appendage. Ligulate florets white, pink, red of various shades, sometimes yellow, with corolla tube 2–4 mm long and limb (15)20–50(60) mm long; tubular florets usually all or some modified in ligulate florets. Achenes sometimes developed (multiplication usually through cuttings).

A widely distributed ornamental plant; in the north, grown as an indoor or greenhouse plant; in the south, also in open ground. Not known in the wild state. Described from garden specimens originating in China or Japan. Type in Paris.

Economic Importance. Numerous cultivars of this species, known as large-flowered Japanese or Chinese chrysanthemums, have been developed through centuries of cultivation along with the selection and hybridization (both natural and induced) of a whole series of Japanese and Chinese species of the genus *Dendranthema*. In contrast to the small-flowered chrysanthemums, here there is no wild species that could be considered as the main ancestral type; but it is absolutely clear that the main ancestors of the large-flowered chrysanthemums should, in addition to *D. indicum*, be the species with the much larger (larger

than in *D. indicum*), white or pink ligulate florets. Thus, according to O. Stapf (*Curtis's Bot. Mag.* CLVI, 1933. sub tab. 9330), the probable ancestral species of *D. morifolium*, treated by him under the generic name *Chrysanthemum* L., are in China: *C. indicum* L., *C. vestitum* (Hemsl.) Stapf, *C. erubescens* Stapf, and in Japan: *C. indicum* L., *C. ornatum* Hemsl., *C. japonense* Nakai, *C. makinoi* Matsum. and Nakai. Essentially these same species are cited also in the works of many other authors, for example, S. Kitamura, *Compositae Japon.*, II, 1940, p. 375.

Numerous works have been devoted to the special features of cultivation and the varietal diversity of the small- and large-flowered chrysanthemums, not to mention the rather detailed information about them available in the different manuals on floriculture (for example, in the book of G.E. Kiselev—*Tsvetovodstvo* [Floriculture], II, 1959, p. 702).

2. ***D. erubescens*** (Stapf) Tzvel. comb. nova.—*Pyrethrum sinense*. α . *sinense* Maxim. in Bull. Acad. Sc. Pétersb. XVII (1872) 425.—*Chrysanthemum sinense* auct. non Sabine: Kom. in Tr. Peterb. Bot. Sada, XXV (1907) 644; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1031.—*C. erubescens* Stapf in Curtis's Bot. Mag. CLVI (1933) sub tab. 9330, nom. nov.—*C. maximoviczianum* Ling in Centr. Inst. Bot. Ac. Peip. III (1935) 459 p. p. nom. nov.—*C. naktongense* auct. non Nakai: Hand.-Mazz. in Acta Horti Gotoburg. XII (1938) 255 p. p.—*C. zawadskii* var. *latilobum* (Maxim.) Kitam. in Acta Phyt. et Geobot. VII (1938) 210.

Perennial. Plant 10–50 cm high, with thin, more or less branched rhizome, more or less covered with crisped simple and appressed bifid hairs. Stems usually few, erect or ascending, densely leafy, strongly branched above middle, very rarely simple. Leaves with numerous punctate glands, more or less covered with short crisped hairs to subglabrous, green above, pale green beneath; basal leaves up to 10 cm long and 5 cm wide, with rather long petiole thickened at base, their lamina reniform to broadly ovate, near base straight truncate or weakly cordate, cuneately decurrent on petiole only at base, subobtusely, 3-lobed or pinnately lobed (or pinnately parted) up to a half, less often beyond, with 2–3 approximate lateral lobes on each side; segments or lobes oblong to broadly ovate, 5–12 mm wide, irregularly toothed or shallow lobed; cauline leaves smaller, with shorter petiole, and ovate or almost round lamina; uppermost leaves many, more or less toothed or lobed, cuneately narrowed into petiole. Capitula 2–15 (very rarely solitary), one on each branch surrounded by reduced bracteal leaves, in lax compound corymb. Involucre 6–10 mm in dia and 2–4 mm long,

more or less hairy; outer involucral bracts narrow-linear, with brownish membranous border near apex, oblong-linear, or linear, throughout with rather wide membranous border. Ligulate florets white or pinkish-white, with compressed but almost wingless corolla tube 1.2–1.5 mm long and ligule 8–15 mm long and 2–3 mm wide; corolla of tubular florets 1.8–2.4 mm long. Achenes 1.3–1.8 mm long, lacking corona. Flowering September to October.

Rocks, stony slopes; up to lower mountain zone.— *Far East*: Ussuri (Posjet Bay). *General distribution*: Northeastern China, Korea. Described from Far East. Type in London; isotypes in Leningrad.

Note. Both *Chrysanthemum erubescens* Stapf and *C. maximoviczianum* Ling. are new names for the variety *Pyrethrum sinense* α. *sinense* described by Maximowicz, which he considered the basionym for *Chrysanthemum sinense* Sabine, described from cultivated specimens. In fact, it is a synonym of *Dendranthema morifolium*. As type specimens of *D. erubescens*, I am selecting the specimens collected by Maximowicz from the area of Posjet Bay and distributed by him to important herbaria of the world.

The systematic position of the species *Chrysanthemum reflexum* Ueki (in *Suigengakuho*, XXI, 2 (1928) 13), described from Korea, is not clear to me; it either is *D. erubescens* (in which case the name of the latter species must be changed according to the rules of priority), or it is a synonym of the next species.

3. **D. nektongense** (Nakai) Tzvel. comb. nova.—*Leucanthemum sibiricum* var. *latilobum* (Maxim.) Primit. fl. amur. (1859) 156.—*Chrysanthemum sibiricum* var. *latilobum* (Maxim.) Kom. in Tr. Peterb. Bot. Sada, XXV (1907) 642; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II (1932) 1031, tabl. 307.—*C. naktongense* Nakai in Bot. Mag. Tokyo, XXIII (1909) 186 and Fl. Kor. II (1911) 26, t. VIII.—*C. zawadskii* var. *latilobum* (Maxim.) Kitam. in Acta Phyt. et Geobot. VII (1938) 210 p. p.—*C. zawadskii* ssp. *latilobum* Kitag. Lin. fl. Mansh. (1939) 444.—**lc.**: Nakai, loc. cit.; Kom. and Alis. loc. cit.

Perennial. Plant 15–70 cm high, with thin, more or less branched rhizome, more or less covered with crisped simple and appressed bifid hairs. Stems usually solitary or few, erect, densely leafy, simple or branched above middle. Leaves with numerous punctate glands, on both sides more or less covered with short, crisped simple hairs or subglabrous; basal leaves up to 10 cm long and 5 cm wide, with rather
376 long (often exceeding lamina) petiole thickened at base, oblong-ovate to almost round, usually not deeper than middle pinnately or palmately 3–9 lobed with oblong or ovate, more or less toothed or shallow lobed

lobes, basally round or truncate but always cuneately narrowed into petiole; cauline leaves like basal but with shorter petiole and usually with short axillary branches, their lamina oblong-ovate, cuneately narrowed toward base. Capitula solitary or 2–5 (sometimes to 10), solitary at apices of leafy branches of stem, sometimes forming lax irregular corymb. Involucres 10–16 mm in dia and 4–6 mm long, more or less hairy; outer involucre bracts narrow-linear, usually with membranous border only at apex; inner bracts oblong-linear, basally somewhat narrow, with wide, light-colored or brownish, membranous border. Ligulate florets white or light-pink, with corolla tube 1.4–2.0 mm long and ligule 12–26 mm long and 3.0–5.5 mm wide; corolla of tubular florets 2.3–3.0 mm long. Achenes 1.5–2.0 mm long, lacking corona. Flowering August to October.

Thinned pine and oak forests, scrubs, stony slopes; up to lower mountain zone.—*Far East*: Ussuri (southern and southwestern part). *General distribution*: China (northeastern part), Korea. Described from Korea. Type in Tokyo.

Note. Morphologically, this species is completely different from the widely distributed *D. zawadskii*, to which it has often been appended as a variety, but is quite close to *D. erubescens*, being a more northern ecogeographical race linked mainly to the forest groups.

Series 4. Zawadskiana Tzvel.—Herbaceous plants; leaves (at least basal and lower cauline) considerably deeper than middle, often up to rachis pinnately or palmately divided or incised, with narrow-linear or oblong-linear segments or lobes, in turn often cut or divided; ligulate florets white or pink of various shades.

4. ***D. zawadskii*** (Herb.) Tzvel. comb. nova.—*Chrysanthemum zawadskii* Herb. Addit. ad Fl. Galic. (1831) 44, t. 1; DC. Prodr. VI, 67; Trautv. in Tr. Peterb. Bot. Sada, VIII, 2 (1883) 458.—*C. arcticum* auct. non L.: Ldb. Fl. Alt. IV (1833) 115.—*C. sibiricum* Turcz. ex DC. Prodr. VI (1837) 46, in syn.—*C. gmelinii* Ldb. ex Turcz. in Bull. Soc. Nat. Mosc. I (1838) 94, nom. nud.—*C. sibiricum* Fisch. ex Turcz. Fl. baic.-dahur. II (1856) 42, in syn.—*C. arcticum* ssp. *alaunicum* K.-Pol. in sb. "25 Let Nauchno.pedag. i Obshch. Deyat. B.A. Kellera"* (1931) 318.—*C. sibiricum* var. *acutilobum* (DC.) Kom. and Alis. Oprod. Rast. 377 Dalnevost. Kr. II (1932) 1031.—?*C. hwangshanense* Ling. in Contr. Inst. Bot. Acad. Peip. III (1935) 472, t. 49.—*C. kozo-poljanskii* Golitz.

*In the collection of articles "25 years of Scientific-Pedagogic and Social Work of B.A. Keller."—Translator.

in Byull. Obshch. Estestv. pri Voronezhsk. Univ. V (1949) 21, nom. nud.—*Leucanthemum sibiricum* var. *acutlobum* DC. op. cit. 46; Turcz. op. cit. (1856) 42.—*L. sibiricum* auct. non DC.: Ldb. Fl. Ross. II, 541; Kryl. Fl. Zap. Sib. XI, 2741.—*L. alaunicum* (K.-Pol.) Golitz, et ssp. Kozo-Poljanskii Golitz. in Majeovsky, Fl. Izd. 8 (1954) 581.—*Tanacetum gmelinii* Sch. Bip. Tanacet. (1844) 35 p. p. nom. nov.—*T. alaunicum* K.-Pol. in Delect. sem. horti bot. univ. Voroneg. II (1930) 30.—*T. zawadskii* (Herb.) B. Pawl. Ochron. Przyr. (1934) 14 and Pl. Polon. exs. No. 272.—*Pyrethrum zawadskii* (Herb.) Nym. Syll. fl. Eur. (1854-1855) 11.—*P. sibiricum* (DC.) Stank. in Stank. and Tal. Oprod. Rast. Evrop. Ch. SSSR (1949) 630.—*Ic.*: Herb. loc. cit.; Jav. Csap. Ic. Fl. Hung. (1933) 523; Ling, loc. cit.—*Exs.*: Fl. exs. Austro-Hung. No. 2673; Fl. exs. reip. Bohem.-Sloven. No. 1098; Fl. Hung. exs. No. 82; Fl. Polon. exs. No. 182; Pl. Polon. exs. No. 272; GRF No. 419.

Perennial. Plant 15–50 cm high, with thin, more or less branched rhizome, more or less covered with short bifid and simple hairs. Stems solitary or few, erect or at base ascending, rather densely leafy, simple or with few branches mainly in upper half. Leaves with numerous punctate glands, sometimes also appressed-hairy to subglabrous; basal and lower cauline leaves to 8 cm long and 4 cm wide, with rather long (often 1.5–2 times as long as lamina), narrow-winged petiole, ovate to almost roundish, cuneately narrowed at base, usually twice (rarely once) pinnately cut or divided, with 1–3 pairs of segments or lobes of first order, often coalesced at base, terminal lobes linear to linear-oblong, usually 2–3 mm wide, at apex short and abruptly acuminate; middle cauline leaves with shorter, often broad-winged petiole, sometimes with reduced lateral segments approximate to their base, usually pinnately parted with longer, acuminate, terminal lobe; uppermost leaves entire or pinnately lobed. Capitula solitary or 2–5, singly at apices of stem and its leafy lateral branches, usually not forming corymb, peduncles relatively sparsely hairy, sometimes finely tomentose. Involucres 10–20 mm in dia and about 4.5–6.0 mm long, more or less hairy to completely glabrous; involucre bracts with rather wide, light-colored or brownish membranous border, outer bracts broadly linear to oblong, inner linear to oblong-linear. Ligulate florets white, pink, pinkish-violet, of various shades, corolla tube 1.8–3.0 mm long and ligule 12–26 mm long and 3–6 mm wide; corolla of tubular florets about 2.5–3.0 mm long. Achenes 1.8–2.5 mm long and about 0.5–0.6 mm wide, lacking corona. Flowering July to September.

378 Stony slopes, forest glades, pine and larch forests, rocks, mainly on calcareous and sandy soils; up to middle mountain zone.—*European part*: Dvina-Pechora (Urals and along Pinega River at its confluence with Northern Dvina), Volga-Kama, Volga-Don (limestones

along Don and Oskol rivers), Trans-Volga (eastern part); *Western Siberia*: Ob River Area (southern part), Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei (southern part), Angara-Sayans, Lena-Kolyma, Dauria; *Far East*: Zeya-Bureya, Ussuri (Bureyi Range). *General distribution*: Central Europe (Carpathians), Mongolia (northern part), China (northeastern part). Described from Carpathians. Type in Vienna; isotype in Leningrad.

Note. A highly polymorphic species forming throughout its wide range numerous more or less distinctive populations distinguished mainly by the color of the ligulate florets and the shape of the leaves. However, comparison of the extensive material of this species from the Carpathians, Urals, and the Baikal Region in the Herbarium of the Botanical Institute of the Academy of Sciences of the USSR shows a complete absence of differences among the Carpathian, Ural and Baikal materials as a whole, given the considerable variation of populations within each of these three regions. The segregation of plants from geographically isolated habitats of this species in the Central Russian Plains into separate ecogeographical races (*Tanacetum alaunicum* K.-Pol. from the upper reaches of the Oskol River and *Chrysanthemum kozo-poljanskii* Golitz. from the Don River in the vicinity of the village of Plyushchan) is based more on the absence of comparable material from other regions than on morphological differences between them and specimens of *D. zawadskii* from Siberia and the Carpathians.

Economic Importance. Deserves to be introduced into cultivation as an ornamental plant.

5. *D. mongolicum* (Ling) Tzvel. comb. nova.—*Leucanthemum sibiricum* var. *peleiolepis* Trautv. in Middendorff's Sibir. Reise I, 2 (1847) 37.—*L. sibiricum* var. *alpina* F. Schmidt, Reisen in Amur-Lande und Sach. (1863) 49.—*Chrysanthemum mongolicum* Ling in Contr. Inst. Bot. Acad. Peip. III (1935) 463, fig. 2 and t. 46.—*Tridactylina turczaninovii* Krasch. in herb.—**lc.**: Ling, loc. cit.

Perennial. Plant 5–25(30) cm high, with thin, more or less branched rhizome, more or less covered with appressed, simple and bifid hairs, often covered with fine tomentum. Stems solitary or few, erect or at base ascending, rather densely leafy, simple or with few lateral branches almost from base. Leaves with not always distinct punctate glands, more or less appressed-hairy to completely glabrous; basal and lower cauline leaves like previous species, but, on the average less incised; middle cauline leaves usually pinnately parted, or lobed; terminal lobe of all leaves often with relatively long cusp. Capitula solitary or 2–5, singly at apices of stem and lateral branches, peduncles, particularly in upper part, rather profusely tomentose. Involucre 10–18 mm in dia

379 and 4–6 mm long, with more or less loose tomentum at base, often on dorsal side; involucre bracts with rather wide, blackish-brown membranous border. Ligulate florets white or pink, of various shades, corolla tube 1.2–2.5 mm long and ligule 12–25 mm long and 3–5 mm wide, often sterile because of a partial reduction of the pistil; corolla of tubular florets 2.5–3.0 mm long. Achenes 1.5–2.3 mm long, lacking corona. Flowering August to September.

Stony and rubbly slopes, gravel beds, sometimes in thinned forests; in the north in stony tundra, in the south mainly on bald mountains in middle and upper mountain zones.—*Arctic*: Arctic Siberia (Taimyr, lower reaches of Lena and other rivers); *Eastern Siberia*: Yenisei, Lena-Kolyma, Angar-Sayans, Dauria; *Far East*: Okhotsk, Uda River Area, Zeya-Bureya, Ussuri (Bureya Range). *General distribution*: Mongolia (northern part), China (northeastern part). Described from China. Type in Peking.

Note. In Yakutia and the Far East, plants are found with narrower leaf lobes and in this respect seemingly transitional to *D. maximowiczii*. In relation to the previous species, it is a more alpine and arctic race, linked with it by specimens with intermediate characters.

6. ***D. maximowiczii*** (Kom.) Tzvel. comb. nova.—*Chrysanthemum maximowiczii* Kom. in Izv. Peterb. Bot. Sada, XVI (1916) 179; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II (1932) 1028.—*C. maximowiczianum* var. *dissectum* Ling in Contr. Inst. Bot. Akad. Peip. III (1935) 461, fig. la–e.—*C. nactongense* var. *dissectum* (Ling) Hand.-Mazz. in Acta Horti Gotoburg. XII (1938) 256.—*C. zawadskii* ssp. *acutilobum* (DC.) Kitag. Lin. fl. Mansh. (1939) 444 p. p.—**lc.**: Ling, l. c.

Biennial. Plant 8–40 cm high, with thin, more or less branched rhizome, covered with short bifid and simple hairs, sometimes finely cobwebby tomentum in upper part. Stems solitary or few, erect, simple or with few branches. Leaves with inconspicuous punctate glands, more or less sparsely hairy to completely glabrous; basal and lower cauline leaves 8–10 cm long, and 4 cm wide, with rather long petiole, often longer than lamina, ovate to almost roundish, twice pinnately cut, with 1–3 pairs of first order segments, terminal lobe narrow-linear to linear-lanceolate, up to 1.5(2.0) mm wide, relatively long-acuminate; middle cauline leaves usually less incised, but also with terminal lobe narrower than in previous species. Capitula usually 2–5 on stem, solitary at apices of leafy branches, often forming lax irregular corymbose inflorescence, peduncles more or less hairy to finely tomentose. Involucres 10–18 mm in dia and about 4.5–5.5 mm long, more or less hairy; involucre bracts with rather wide, light colored or brownish

membranous border. Ligulate florets white, less often pinkish-white, with corolla tube 1.8–2.5 mm long and ligule 12–24 mm long and 3–5 mm wide; corolla of tubular florets 2.5–3.0 mm long. Achenes 1.5–2.5 mm long, lacking corona. Flowering August to September.

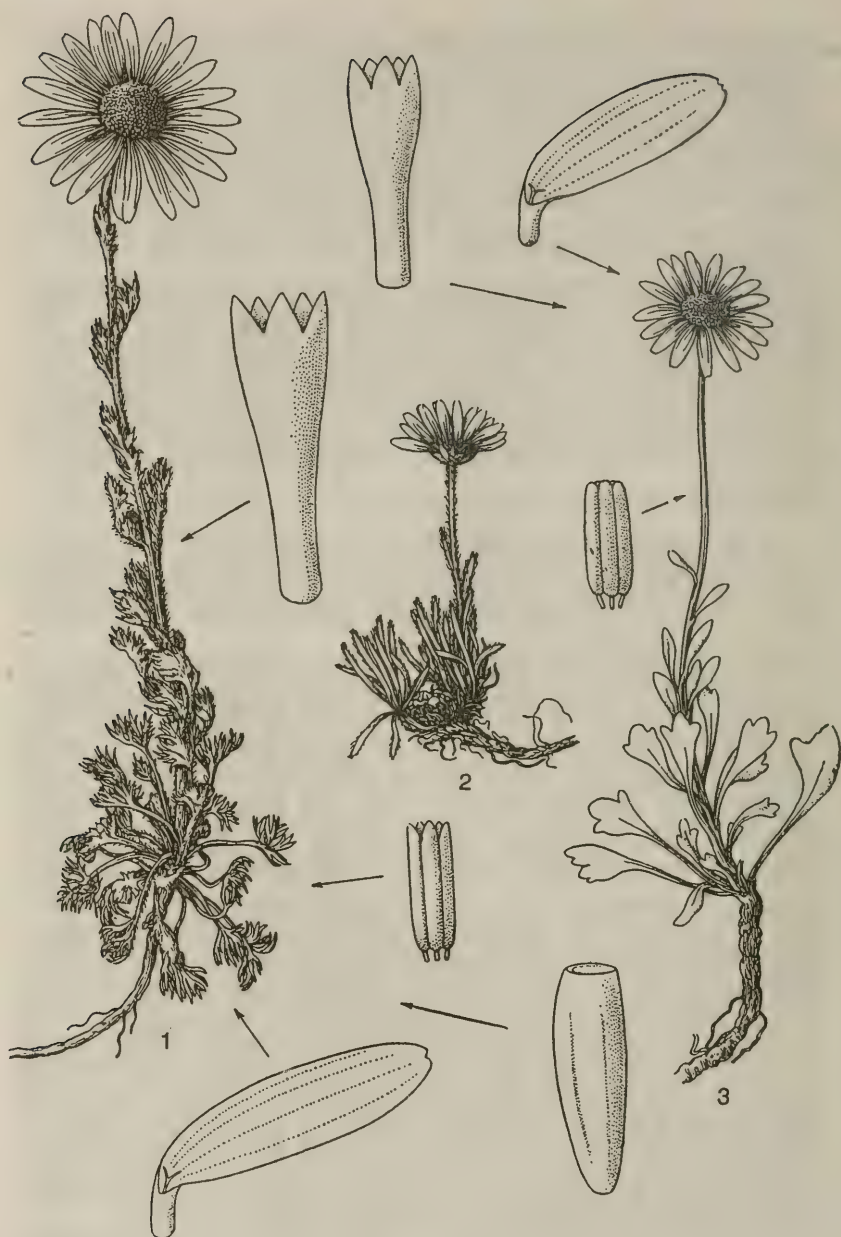
Rocks, stony slopes; up to middle mountain zone.—*Far East*: Ussuri. *General distribution*: China (northeastern part), Korea. Described from Far East (southern Sikhote-Alin). Type and isotype in Leningrad.

Note. Possibly, *Chrysanthemum coreanum* (Lev. and Vant.) Nakai ex Mori (*Enum. Cur. Pl.* (1922) 352 = *Matricaria coreana* Lev. and Vant. in Fedde, *Repert.* VIII (1910) 169), a species described from Korea, belongs to this species (and in relation to it is a priority name). It is difficult to say whether it belongs to any other species or should be separate, as there is not reliably identified herbarium material of this species.

7. **D. sichotense** Tzvel. sp. nova in Addenda, XXV, 879.—*Chrysanthemum sibiricum* var. *alpinum* Nakai in Bot. Mag. Tokyo, XXXI (1917) 109.—*C. zawadskii* var. *alpinum* (Nakai) Kitam. in Acta Phyt. et Geobot. VII (1938) 210.

Perennial. Plant 10–25 cm high, with thin, more or less branched rhizome, grayish-tomentose, mixed with long, simple and bifid hairs. Stems solitary or few, erect, densely leafy, simple or with (1–2) lateral branches in upper part. Leaves grayish-green from lax tomentum, with inconspicuous punctate glands; basal and lower cauline leaves numerous, up to 4 cm long and 2 cm wide, with rather long (often longer than lamina) petiole, reniform to almost roundish, twice pinnately cut, with 2–3 pairs of lobes; terminal lobes narrow-linear (to 1 mm wide), with long- and gradually acuminate apex; middle and upper cauline leaves smaller, with shorter petiole or sessile, uppermost leaves with oblong lamina, pinnately parted, with 3–5 pairs of entire or more or less divided lobes. Capitula usually solitary, less often 2–3, on single stem, on relatively short peduncles. Involucres 12–18 mm in dia and 4.5–6.0 mm long, dorsally lanate-tomentose; involucre bracts with wide, blackish-brown membranous border. Ligulate florets pink or violet-pink, corolla tube 2.0–2.5 mm long and ligule 12–24 mm long; corolla of tubular florets about 3 mm long. Achenes 1.5–2.0 mm long, lacking corona. Flowering July to August (Plate XVI, Fig. 1).

383 Rubbly and stony slopes, balds, above 1,200 m.—*Far East*: Ussuri (southern Sikhote-Alin). *General distribution*: Korea. Described from southern Sikhote-Alin. Type (Snezhnaya Mountain in southern Sikhote-Alin, at about 1,500 m 15.VII.1930, No. 767, I. Schischkin) and isotype in Leningrad.



1 — *Dendranthema sichotense* Tzvel., habit, corolla of ligulate floret, corolla of tubular floret, anther tube, achene; 2 — *D. integrifolium* (Richards.) Tzvel., habit; 3 — *D. hultenii* (A. and D. Löve) Tzvel., habit, corolla of ligulate floret, corolla of tubular floret, anther tube.

Note. In relation to the previous species, it is a higher mountain (bald mountain) ecogeographical race, differing from the former by the abundant tomentose pubescence of the whole plant, color of the ligulate florets, blackish-brown membranous border of the involucre bracts, and the form of the basal leaves.

Economic Importance. Deserves to be introduced into cultivation as an ornamental plant.

8. **D. weyrichii** (Maxim.) Tzvel. comb. nova.—*Leucanthemum weyrichii* Maxim. Prim. fl. amur. (1859) 156.—*Chrysanthemum hakusanense* Makino in Bot. Mag. Tokyo, XXIV (1910) 302.—*C. lucidum* Nakai in Bot. Mag. Tokyo, XXXII (1918) 110.—*C. weyrichii* (Maxim.) Miyabe and Miyake, Fl. Saghal. (1915) 251.—*Tanacetum weyrichii* (Maxim.) Kitam. Compos. Japon. II (1940) 348, nom. alt.—**Ic.:** Makino, op. cit. 303, fig. XXI.

Perennial. Plant 20–50 cm high, with relatively thin, more or less branched rhizome, more or less covered with short bifid and simple hairs. Stems solitary or few, erect or at base ascending, usually branched above middle, less often simple, relatively sparsely leafy. Leaves glabrous or subglabrous, with inconspicuous punctate glands; basal and lower cauline leaves to 8–10 cm long and 4 cm wide, with rather long petiole, ovate or broadly ovate, twice pinnately cut (or divided), with 1–3 pairs of primary segments, usually more or less approximate; terminal lobe lanceolate to lanceolate-linear, usually 1–2 mm wide, on the average wider than in *D. maximowiczii*, but narrower than in *D. zawadskii*, rather long-acuminate; middle cauline leaves usually less incised, with rather shorter petiole to subsessile. Capitula usually 2–8 on single stem (solitary at apices of its leafy lateral branches), often forming lax corymbose inflorescence, less often solitary; peduncles usually hairy to finely tomentose. Involucres 10–15 mm in dia and 4.0–5.5 mm long, more or less hairy to completely glabrous; involucre bracts with rather wide, brownish membranous border. Ligulate florets pink or pinkish-white, with corolla tube 1.0–1.8 mm long and ligule 12–18 mm long; corolla of tubular florets 2.4–2.8 mm long. Achenes 1.5–2.2 mm long, with somewhat acute, raised upper border but lacking corona. Flowering August to September.

Stony slopes, rocks; up to lower mountain zone.—*Far East:* Sakhalin. *General distribution:* Japan (northern part), Korea(?). Described from Sakhalin. Type in Leningrad.

Note. Very similar to *D. zawadskii* and *D. maximowiczii*; it is an ecogeographical race occupying an intermediate position between them with respect to the nature of the leaf incisions.

9. **D. littorale** (Maekawa) Tzvel. comb. nova.—*Chrysanthemum littorale* Maekawa in Trans. Sapporo Nat. Hist. Soc. VIII (1921) 15, t. 1, fig. 14–22.—*C. weyrichii* var. *littorale* (Maekawa) Kudo, Contr. Knowl. North Saghal. (1923) 58.—**lc.**: Maekawa, l. c.

Perennial. Plant 10–20 cm high, with relatively thin, more or less branched rhizome, more or less covered with short bifid hairs to subglabrous. Stems solitary or few, somewhat thick, almost always branched near base, with short divergent branches, densely leafy (particularly in lower part), leaves glabrous or subglabrous, with numerous punctate glands, somewhat thick; basal and lower cauline leaves to 10 cm long and 5.5 cm wide, with long (usually longer than lamina), narrow-winged petiole thickened at base, reniform to ovate, with narrow-cuneate base, twice pinnately parted (or divided), with 1–3 approximate pairs of lateral lobes, terminal lobes linear to broadly lanceolate, sometimes some shallow-lobed or toothed, 1–3 mm wide, short-acuminate; middle cauline leaves smaller, cuneately narrowed into short winged petiole, ovate or oblong, often pinnately parted, uppermost leaves some undivided and entire. Capitula usually 2–8, solitary, at apices of stem and its leafy lateral branches on relatively short (1–3 cm long), more or less hairy peduncles, less often single. Involucre 12–18 mm in dia and 4–6 mm long, glabrous or subglabrous; outer involucre bracts usually almost lacking membranous border, inner with wide, light colored or brownish membranous border. Ligulate florets pink or pinkish-white, corolla tube 1.5–2.0 mm long and limb 16–25 mm long and 3.0–5.5 mm wide; corolla of tubular florets 2.5–3.0 mm long. Achenes 1.5–2.2 mm long, with somewhat acute raised upper border, but lacking corona. Flowering August to September.

Rocks and stony slopes of seacoasts.—*Far East*: Sakhalin, Kuril Islands. *General distribution*: Japan (northern part). Described from Japan (Hokkaido Island). Type in Sapporo.

Note. This species usually has been united with the previous species despite quite consistent habit differences and a very definite ecological cohesiveness. On Sakhalin Island, both species apparently are separated geographically as well. In habit, it resembles the species of the next section, to which it is also ecologically close.

Section 2. Arctanthemum Tzvel. sect. nova in Addenda XXV, 879.—Apical appendage of anthers oblong, obtuse, broadly round; 385 receptacle glabrous; achenes not becoming slippery when soaked. Plants with thick, fleshy rhizome and leaves with more or less lobed or divided, somewhat thick lamina; hairs long and simple, often entirely lacking.

Type of section: *Dendranthema arcticum* (L.) Tzvel.

Note. S. Kitamura (S. Kitamura, *Compos. Japon.* II, 1940, 345–349), based only on the achenes not becoming slippery when soaked,

refers species of this section, as well as *D. weyrichii* from the previous section, to his subsection "*Leucanthemum*" of the genus *Chrysanthemum* L. sensu lato, but *D. zawadskii*, with the group of closely related species to subsection "*Dendranthema*." However, the character—slipperiness of the fruit wall hardly deserves such importance, particularly when it is not accompanied by other more or less substantial characters. Moreover, the slippery fruit wall is an adaptive character linked with a relatively hot and dry climate, and it is not surprising that in species confined to more humid and much colder regions the muciferous cells of the fruit wall disappear entirely. Regarding other characters (structure of achenes, corolla, receptacle, involucre, and others), the species of section *Arctanthemum* show incomparably great closeness to the genus *Dendranthema*, to which I refer them, rather than to the genus *Leucanthemum* Mill.

All three species of the section are closely related ecogeographical races of a single series.

10. **D. kurilense** Tzvel. nom. nov.—*Chrysanthemum arcticum* var. *yezoense* Maekawa in Trans. Sapporo Nat. Hist. Soc. VIII (1921) 14, t. 1, fig. 1–4, non *Chrysanthemum yezoense* Maekawa, ibid. 12.—**lc.**: Maekawa, Ibid.

Perennial. Plant 10–35 cm high, with thick, fleshy rhizome, subglabrous. Stems solitary or few, erect, simple or with few lateral branches, leafy mainly in lower half. Leaves glabrous or subglabrous (cobwebby pubescence disappearing later), lacking distinct punctate glands; basal and lower cauline leaves numerous, to 10 cm long and 5 cm wide, with long petiole thickened at base, reniform to rotund, near base more or less truncate or weakly cordate and only at base cuneately decurrent on petiole, with 3–5 palmate lobes usually not divided to more than middle, lobes obtusely and irregularly toothed or shallow lobed; middle cauline leaves strongly reduced, with narrow winged petiole or sessile, oblong, more or less pinnately lobed lobes, with short cartilaginous cusp. Capitula solitary or 2–5 on single stem, on rather long (to 8 cm) peduncles. Involucres 12–18 mm in dia and 5–7 mm long, glabrous or at base more or less cobwebby lanate. Involucral bracts with brownish membranous border. Ligulate florets white, corolla tube 0.8–1.5 mm long and lobe 10–22 mm long and 3–5 mm wide; corolla of tubular florets 2.3–3.0 mm long. Achenes 1.8–2.6 mm long and about 0.5 mm wide, at apex lacking corona but with indistinctly raised, somewhat acute upper border. Flowering July to September.

Coastal rocks, gravel beds.—*Far East*: Kuril Islands (Iturup Island). *General Distribution*: Japan (northern part). Described from Japan (Hokkaido Island). Type in Sapporo.

Note. *Chrysanthemum yezoense* Maekawa (= *C. arcticum* ssp. *maekawanum* Kitam. *Compos. japon.* II, 1940, p. 347) from the Island of Hokkaido, with anthers having lanceolate-ovate, subacute, apical appendages, apparently belongs to the preceding section, differing from *D. littorale* only by the less divided leaves with wider lobes.

11. **D. arcticum** (L.) Tzvel. comb. nova.—*Chrysanthemum arcticum* L. Sp. pl. (1753) 889.—*C. adustum* Fisch. ex Trautv. in Tr. Peterb. Bot. Sada, VIII, 2 (1883) 457.—*C. arcticum* ssp. *gmelinii* (Ldb.) Kitam. in Acta Phyt. et Geo-bot. IV (1935) 37.—*Matricaria arctica* Desr. in Lam. Encycl. III (1792) 735.—*Leucanthemum arcticum* (L.) DC. Prodr. VI (1837) 45, quoad nomen.; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1031.—*L. sibiricum* DC. op. cit. 46, excl. var.—*L. gmelinii* Ldb. Fl. Ross. II (1845–1846) 541.—*Tanacetum arcticum* (L.) Sch. Bip. Tanacet. (1844) 35.—*T. gmelinii* Sch. Bip. ibid. 35, p. p., nom. novum (= *Leucanthemum sibiricum* DC.).—*Pyrethrum arcticum* (L.) Stank. in Stank. and Tal. Oprod. Rast. Evrop. Ch. SSSR (1949) 630, quoad nomen.—**Ice.** Gmel. Fl. Sib. II (1749) 203, t. 84; Hult. Fl. Kamtch. IV (1930) 173.

Perennial. Plant 10–30 cm high, with thick, fleshy, creeping rhizome, glabrous or subglabrous (with cobwebby pubescence disappearing later). Stems solitary or few, erect or basally ascending, simple or with few lateral branches, leafy mainly in lower half. Leaves glabrous or subglabrous, lacking punctate glands; basal and lower cauline leaves rather numerous, to 9–12 cm long and 3–4 cm wide, with long petiole thickened at base, oblong to almost round, always with broad cuneate base, palmately or pinnately lobed usually not more than to middle, with 3–7 obtuse or subobtuse lobes, large and coarsely toothed or entire; middle cauline leaves strongly reduced, with short winged petiole or subsessile, pinnately or palmately lobed, uppermost leaves linear, entire. Capitula solitary or 2–5 on single stem, on rather long peduncle. Involucres 12–22 mm in dia and 4–7 mm long, glabrous or at base more or less cobwebby-woolly; involucral bracts with rather wide, blackish-brown, less often brownish membranous border. Ligulate florets white, corolla tube 0.8–1.5 mm long and limb 10–22 mm long and 3–5 mm wide; corolla of tubular florets 2.3–3.0 mm long. Achenes 1.8–2.6 mm long and about 0.5 mm wide, apically lacking corona, but with indistinctly raised, subacute border. Flowering July to September.

Stony and sandy places, gravel-beds, grassy patches along coast.—**Far East:** Kamchatka, Comander Islands, Okhotsk, Uda River Area, Sakhalin, Kuril Islands, Ussuri. **General distribution:** Pacific Coast of North America (south up to U.S.A.). Described from Kamchatka. Gmelin's drawing cited above is the type specimen.

Note. Although Gmelin's drawing is the type for this species, both De Candolle and Ledebour regarded the following species [*D. hultenii*] as *Chrysanthemum arcticum* L. and on the basis of Gmelin's drawing described two new species (*Leucanthemum sibiricum* DC. and *L. gmelinii* Ldb.), which are more recent synonyms of *Chrysanthemum arcticum* L.

12. **D. hultenii** (A. and D. Löve) Tzvel. comb. nova.—*Leucanthemum arcticum* auct.: DC. Prodr. VI (1837) 45, quoad. plant.; Ldb. Fl. Ross. II, 541; Kryl. Fl. Zap. Sib. XI, 2741, non *Chrysanthemum arcticum* L.—*L. hultenii* A. and D. Löve in Bot. Notis. (1961) 44.—*Pyrethrum arcticum* (L.) Stank. in Stank. and Tal. Opred. Rast. Evrop. Ch. SSSR (1949) 630, quoad plant.—*Chrysanthemum arcticum* ssp. *polaris* Hult. in Sv. Bot. Tidskr. XLIII (1949) 776.—**Ic.:** Fedtsch. and Fler. Evrop. Ross. (1911) 975.

Perennial. Plant 6–20 cm high, with thick, fleshy, creeping rhizome, glabrous, less often subglabrous. Stems solitary or few, erect or basally ascending, simple, leafy mainly in lower half. Leaves glabrous, lacking punctate glands; basal and lower cauline leaves rather numerous, to 8 cm long and 3 cm wide, with long (sometimes 1.5–2 times as long as lamina), more or less winged petiole, oblong to almost round, cuneately narrowed toward base, in upper part with 3, less often 5 shallow, obtuse lobes or teeth; middle cauline leaves strongly reduced, usually entire or subentire. Capitula solitary. Involucres 12–18 mm in dia and 4–6 mm long, glabrous; involucre bracts with wide, blackish-brown, membranous border. Ligulate florets white, corolla tube 0.6–1.5 mm long and limb 8–15 mm long and 2–4 mm wide; corolla of tubular florets 2.5–3.0 mm long. Achenes 1.5–2.2 mm long and about 0.5 mm wide, lacking corona. Flowering July to August. (Plate XVI, Fig. 3).

Stony and sandy places, gravel beds, grassy patches along coast.—**Arctic:** Arctic Europe, Novaya Zemlya, Arctic Siberia (rarely), Chukotka, Anadyr. **General distribution:** Arctic. Described from European Arctic. Type in Stockholm.

Note. Specimens intermediate between this and the previous species are common on the Bering Sea Coast.

Section 3. Haplophylla Tzvel. sect. nova in Addenda, XXV, 880.—Apical appendages of anthers oblong, obtuse, widely rounded; receptacle less often hairy; achenes slippery when soaked. Plants with relatively thin, more or less branched rhizome and entire, narrow-linear leaves; pubescence of long and simple hairs.

A monotypic section.

13. **D. integrifolium** (Richards.) Tzvel. comb. nova.—*Chrysanthemum integrifolium* Richards. in Frankl. Journ. Bot. Appl (1823) 33.—*C. scapigerum* C.A.M. in herb.—*Leucanthemum integrifolium* (Richards.) DC. Prodr. VI (1837) 45; Ldb. Fl. Ross. II, 540.—*L. algidum* Fisch. ex Trautv. in Tr. Peterb. Bot. Sada, VIII, 2 (1883) 452.—*Tanacetum integrifolium* (Richards.) Sch. Bip. Tanacet. (1844) 35.— **Ic.**: Hook. Fl. bor.-amer. (1833) t. 109.

Perennial. Plant 3–15 cm high, with strongly branched rhizome, usually forming dense mats, more or less covered with long simple hairs. Stems erect or at base ascending, simple, with long, distant hairs, with 1–3 (rarely 5) reduced leaves above base. Leaves subglabrous to grayish from profuse pubescence of long simple hairs, lacking punctate glands; basal leaves numerous, narrow-linear, to 2.0–2.5 cm long and 1.5 mm wide, entire, obtuse or subacute; cauline leaves few, similar to basal leaves. Capitula solitary on long, usually more or less with apically woolly-cobwebby peduncles. Involucres 6–12 mm in dia and 3–5 mm long, at base more or less woolly-pubescent; involucre bracts with wide, blackish-brown, membranous border. Ligulate florets white, corolla tube 1.0–1.5 mm long and limb 9–14 mm long and 2–3 mm wide; corolla of tubular florets 2.0–2.5 mm long. Achenes 1.3–2.0 mm long and about 0.5 mm wide, with slightly raised, subacute upper border, but lacking corona. Flowering July to August. (Plate XVI, Fig. 2).

Stony slopes, relatively dry parts of tundra, usually along coast.—**Arctic**: Chukotka, Anadyr. **General distribution**: Arctic America (south to British Columbia, east to Hudson Bay). Described from Arctic America. Type in London.

Note. I did not see mature achenes of this species; the ovaries are strongly flattened dorsally with prominent lateral ribs which often are broadly winged in the outer florets of the capitulum; however, these peculiarities apparently resulted from the deformation of the ovaries during drying and are hardly evident in the mature achenes.

GENUS 1542. **Tridactylina** (DC.) Sch. Bip.^{1,2}

Sch. Bip. Tanacet. (1844) 48.—*Pyrethrum* sect. *Tridactylina* DC. Prodr. VI (1837) 61.

Capitula single or 2–30, solitary at apices of stem and its lateral branches, sometimes forming compound corymb, heterogamous, with

¹Treatment by N.N. Tzvelev.

²From the Greek words *treis*—three, and *dactylos*—finger; named for the palmately three-lobed leaves.

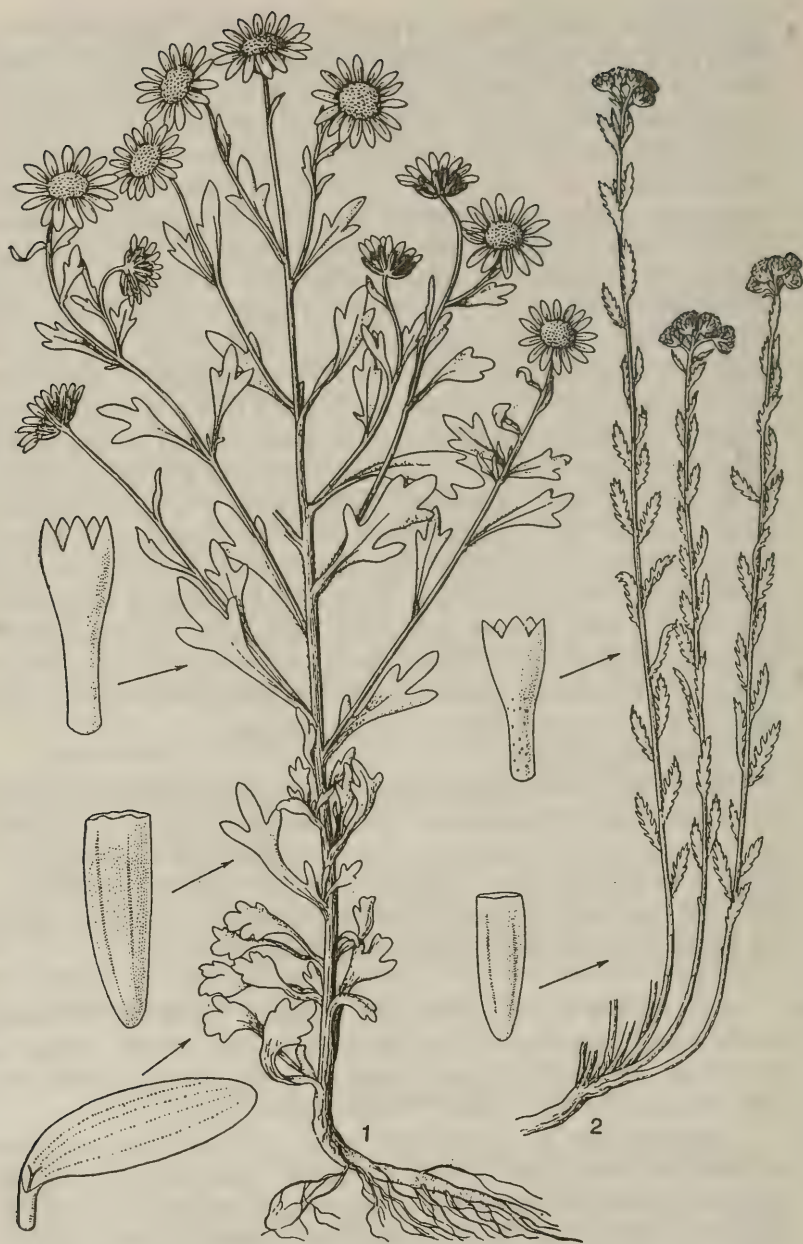
10–25 sterile (with rudiment of pistil), peripheral ligulate florets in single row and numerous bisexual tubular disk florets. Involucres saucer-shaped, 12–25 mm in dia and 5–7 mm long; involucre bracts herbaceous, imbricate, in 3 irregular rows, lanceolate or lanceolate-linear, subobtusate, with wide, blackish-brown membranous border; inner bracts usually not more than 1.5 times as long as outer bracts. Receptacle strongly and somewhat conically convex, plump, glabrous, finely and weakly punctate-tuberculate, distinctly alveolar. Corolla of ligulate florets yellow or yellowish-white, with strongly flattened, but narrow-winged tube 1.5–2.0 mm long and linear or oblong-linear, limb 7–16 mm long; corolla of tubular disk florets yellow, 2.4–3.0 mm long, with tube distinctly and rather abruptly widened in upper half, with 5 lanceolate-deltoid, weakly bent teeth, a fifth to a fourth as long as tube. Filaments of stamens apically thickened, anthers lacking distinct basal appendages, but with lanceolate, subobtusate apical appendages; pollen grains globose, spinulose. Style[stigma] bifid, style branches linear, truncate. All achenes similar (but not developing in ligulate florets), glabrous, 2.4–3.0 mm long and about 0.7 mm wide, more or less terete, narrowed toward base, with (4) 5(6) indistinctly longitudinal ribs rising at apex as very short (to 0.2 mm long), subobtusate teeth, with very loose pericarp. Weakly hairy (pubescence of short, simple and bifid hairs), annual plants with tap root, erect, simple or branched stem, and alternate trilobate or tripartite leaves.

A monotypic genus.

Note. The genus *Tridactylina* shows a clear and rather close affinity with the genus *Dendranthema* (DC.) Des Moul., being, by comparison with the latter, considerably more advanced in its evolution (transition to annual life cycle, reduction of pistils in the ligulate florets), but at the same time retaining relatively prominent longitudinal ribs on the achenes (though this character may be secondary).

- 390 1. **T. kirilowii** (Turcz.) Sch. Bip. Tanacet. (1844) 49; P. Popov, in Sb. Akad. Sukachevu (1956) 450.—*Pyrethrum kirilowii* Turcz. in DC. Prodr. VI (1837) 61 and in Bull. Soc. Nat. Mosc. I (1838) 94; Ldb. Fl. Ross. II, 558; Turcz. Fl. baic.-dahur. II, 47.

Annual. Relatively weakly hairy plant, 6–35 cm high, with short tap root and erect; stem simple or almost from base more or less branched. Leaves dull-green, less often hairy (to subglabrous), punctate-glandular, more or less deeply, 3 (sometimes some 5)-lobed or divided in upper part, gradually narrowed toward base into short, broadly winged petiole, lacking stipules; basal leaves withering early, with longer petiole; cauline leaves numerous, to 5 cm long, uppermost often undivided and entire. Capitula solitary or 2–30, solitary at apices of



1 — *Tridactylina kirilowii* (Turcz.) Sch. Bip., habit, corolla of ligulate florets, corolla of tubular floret, achene; 2 — *Ajania kokanica* (Krasch.) Tzvel., habit, corolla of tubular floret, achene.

stem and its leafy branches, sometimes forming lax irregular corymb. Involucres 12–25 mm in dia and 5–7 mm long; involucre bracts with rather wide, blackish-brown, membranous border; inner bracts 1.5 times, less often 2 times as long as outer bracts. Corolla of ligulate florets yellow or yellowish-white(?), tube and 1.5–2.0 mm long and limb 7–16 mm long; corolla of tubular florets 2.4–3.0 mm long. Achenes 2.4–3.0 mm long, lacking true corona, with very short (to 0.2 mm long), subobtusate teeth as many as ribs. Flowering July to September. (Plate XVII, Fig. 1).

Gravelly and sandy banks of rivers and lakes, sometimes as weed along roads, old fields; up to middle mountain zone.—*Eastern Siberia*: Angara-Sayans (eastern part), Dauria. *General distribution*: Probably found in northern Mongolia. Described from area of Lake Baikal. Type in Leningrad.

GENUS 1543. **Brachanthemum** DC.^{1,2}

DC. Prodr. VI (1837) 44.—*Chrysanthemum* sect. *Argyranthemum* (Webb ex Sch. Bip.) Benth. and Hook. f. Gen. pl. (1876) 426 p. p.; Pflanzenfam. IV, 5 (1889) 278 p. p. — *C.* sect. *Argyranthemum* subsect. *Brachanthemum* (DC.) Ling in Contr. Inst. Bot. Nat. Ac. Peip. III (1935) 476.—*C.* sect. *Brachanthemum* (DC.) B. Fedtsch. Rast. Turk. (1915) 736.

393 Capitula solitary, at apices of stem and its leafy branches (if present) or rather numerous (to 20) and then often in more or less compact, not always regular corymbose inflorescence, heterogamous, with 1–15 pistillate peripheral ligulate florets in single row, very rarely entirely lacking (and then capitula heterogamous, with few pistillate tubular florets) and numerous bisexual tubular disk florets. Involucres goblet-shaped or narrow goblet-shaped (cup-shaped), 4–7 mm in dia and 4–6 mm long; involucre bracts coriaceous-herbaceous, imbricate, in 4 or 5 irregular rows; outer bracts broadly ovate to oblong-ovate, obtuse, with narrow, light colored or brownish membranous border, inner oblong or oblong-linear, 2 or 3 times as long as outer bracts, with wide (particularly in upper part) membranous border. Receptacle very weakly punctate-tuberculate, distinctly alveolate, strongly convex, obtuse-conical, glabrous (rarely subglabrous) or almost flat, covered with short flexuous hairs. Corolla of ligulate florets yellow or white, with dorsally

¹Treatment by N.N. Tzvelev.

²From the Greek words *brachys*—short, and *anthemos*—flower; for the relatively short ligulate florets.

strongly flattened, but not winged, tube 1.2–1.8 mm long and limb oval or oblong, 1.2–8.0 mm long; corolla of tubular disk florets yellow, 2–3 mm long, with narrow tube in lower half quite strongly and abruptly broadened in upper half, with 5 more or less curved, lanceolate-triangular teeth $2/9$ – $1/3$ as long tube. Filaments of stamen thickened in upper part; anthers lacking distinct basal appendages, but with lanceolate or ovate-lanceolate, subobtus apical appendages; pollen grains globose, spinulose. Style[Stigma] bifid; style branches linear, truncate. All achenes similar, glabrous, 1.4–2.5 mm long and about 0.5–0.6 mm wide, almost terete; narrowed toward base, with 5 (rarely to 7) veins, indistinct and almost not raised as ribs (according to M.I. Savchenko in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, XI, 1949, p. p. 201–207—only when dry longitudinal folds of pericarp as though ribs are formed on the surface of achenes), with pericarp becoming slippery when soaked (muciferous cells in irregular rows all over the surface of achenes); pappus entirely absent. Semishrubs, more or less covered with simple and bifid hairs (usually as fine tomentum), with stems woody to a considerable height and alternate, pinnately or palmately cut leaves.

Out of the eight species of the genus occurring in the stony steppes and semideserts of Soviet Central Asia, from the Altai in the north to the Tien Shan in the south, five are found in the USSR.

Type of genus: *Brachanthemum fruticosum* (Ldb.) DC.

Note. *Brachanthemum* is very closely linked with the genus *Dendranthema* (DC.) Des Moul., through section *Dendranthemopsis* (Tzvel.), which may also be treated as a separate genus. Probably other intermediates between these genera will be found in the future in the vast territory of China, but at present, particularly in the USSR, both these genera can easily be delimited.

- 394 1. Corolla of ligulate florets white, with oblong ligule 6–8 mm long; receptacle almost flat, short-hairy, (Altai) (sect. *Dendranthemopsis*) 1. **B. baranovii** (Krasch. and Poljak.) Krasch.
- + Corolla of ligulate florets yellowish-white or yellow, with oval or broadly oval ligule 1.2–3.0 mm long; receptacle strongly convex, glabrous or sub-glabrous (sect. *Brachanthemum*) 2.
2. Most leaves palmately cut into 3 linear-subulate lobes, less often 4 or 5 lobes, at base relatively approximate 3.
- + Most leaves pinnatisect into 4–7 linear-subulate lobes, only uppermost leaves palmately 3-parted 4.
3. Ligulate florets 1–6, ligule 1.2–2.0 mm long, sometimes entirely absent; capitula solitary, less often 2 or 3 on stem 5. **B. kasakhorum** Krasch.

- + Ligulate florets 3–12, ligule 2.2–3.0 mm long; capitula 1–20 on stem, usually aggregated in corymbs 4. **B. fruticosum** (Ldb.) DC.
- 4. Ligulate florets 5–15; involucre 5–7 mm in dia; capitula solitary, less often 2–5 on stem, on long upright peduncles 3. **B. kirghisorum** Krasch.
- + Ligulate florets 1–8; involucre 4–5 mm in dia; capitula (1)3–10(15) on stem, 2–4 capitula usually crowded at stem, apex, rest on long divergent peduncles 2. **B. titovii** Krasch.

Section 1. *Dendranthemopsis* Tzvel. sect. nova in Addenda, XXV, 880.—*Brachanthemum* ser. *Pyrethroides* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 196, diagnosis in Russian.—Involucres goblet-shaped, outer involucre bracts a third to a half as long as inner; receptacle almost flat, covered with short flexuous hairs; ligulate florets white, ligules 6–8 mm long; apical appendages of anthers ovate-lanceolate, subobtus.

A monotypic section.

1. **B. baranovii** (Krasch. and Poljak.) Krasch. op. cit. 196; Kryl. Fl. Zap. Sib. XI, 2756.—*Pyrethrum baranovii* Krasch. and Poljak. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, I (1933) 175.—**lc.**: Krasch. op. cit. 187, fig. 2.

Perennial. Semishrub, 10–35 cm high, with thick, woody, many-headed root, grayish from fine tomentum of appressed simple and bifid hairs. Stems usually numerous, woody to considerable height, erect, densely leafy, branched mainly in upper half. Leaves grayish-green from fine tomentum, with inconspicuous punctate glands, 2.0–2.5 cm long and 1.0–1.5 cm wide, with rather long (almost as long as lamina), very narrow-winged petiole, at base lacking stipules but often with 2 narrow-linear stipules in axillary buds; broadly ovate, pinnately cut up to rather narrow winged rachis, with (1)2–3(4) narrow-linear (to 2 mm wide), obtuse, lateral lobes on each side. Capitula usually numerous, solitary on rather long (to 5–6 cm) peduncle at apices of stem and branches, usually in compound corymb or corymbose-paniculate inflorescence. Involucres 5–7 mm in dia and 5–6 mm long, more or less grayish-tomentose; involucre bracts with rather wide brownish membranous border. Ligulate florets 4–10, white, pistillate, but not always fertile, corolla tube about 1.5 mm long and ligule oblong 6–8 mm long; corolla of disk florets 2.4–3.0 mm long. Achenes 1.4–1.8 mm long. Flowering August to September.

Stony slopes, up to middle mountain zone.—**Western Siberia**: Altai (near mouth of Chuya River). Endemic. Described from Altai. Type in Leningrad.

Section 2. Brachanthemum—Brachanthemum Ser. *Eubranthanthema* Krasch. op. cit. 196 and ser. *Procumbentia* Krasch. ibid. 200, diagnosis in Russian.—Involucres narrow-goblet-shaped, outer involucre bracts $2/5-1/3$ as long as inner; receptacle strongly convex, obtusely conical, glabrous, less often with occasional hairs; ligulate florets yellowish-white or yellow, with ligule 1.2–3.0 mm long; apical appendages of anthers lanceolate, subobtusate.

Type of section: type of genus.

Note. All species of this section are closely related and replace each other with ecogeographical races of the same series.

2. **B. titovii** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 196.—**lc.:** Krasch. Ibid. 193, fig. 5.

Perennial. Semishrubs, 10–35 cm high, with many-headed woody root, finely grayish-tomentose with appressed simple and bifid hairs. Stems usually several, arising from base of plant, woody to considerable height, erect, densely leafy, branched mainly in upper half. Leaves grayish-green from fine tomentum, with inconspicuous punctate glands, to 2.0–2.5 cm long and 1.5 cm wide, with rather long petiole thickened at base, lacking stipules but sometimes with pseudostipules (of axillary bud), broadly ovate, pinnately cut up to very narrow-winged rachis, with (1)2–3(4) linear, subulate, thick lobes on each side having short cartilaginous cusp; upper leaves often palmately 3-parted, uppermost
396 undivided. Capitula (1)3–10(18) on single stem, of which 2–4 usually crowded on short peduncles at stem apex, rest at apices of elongated lateral branches in lax irregular corymb. Involucres 4–5 mm in dia and 4.5–6.0 mm long, more or less finely tomentose; involucre bracts with rather wide, light-colored or brownish, membranous border. Ligulate florets 1–8, yellowish-white, corolla tube 1.2–1.8 mm long and ligule 2.2–3.0 mm long, broadly oval; corolla of disk florets 2–3 mm long. Achenes 2.0–2.5 mm long. Flowering July to August.

Stony and rubbly slopes (particularly on red conglomerates) of middle mountain zone.—*Soviet Central Asia:* Tien Shan, Ketmen, Trans-Ili Alatau ranges. *General distribution:* Dzhungaria-Kashgaria (Chinese Dzhungaria). Described from Trans-Ili Alatau. Type and isotypes in Leningrad.

3. **B. kirghisorum** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 171.—**lc.:** Krasch. ibid. XI (1949) 191, fig. 4.

Perennial. Semishrubs, 5–25 cm high, with many-headed woody root, finely grayish-tomentose with appressed simple and bifid hairs. Stems rather numerous, mainly ascending at base, woody to considerable

height, simple or with few (1–5) elongated lateral branches. Leaves like preceding species. Capitula solitary, less often 2–5 on single stem, on long upright peduncles. Involucres 5–7 mm in dia and 4.5–6.5 mm long, more or less finely tomentose; involucre bracts with rather wide membranous border. Ligulate florets 5–12(15), yellowish-white(?), corolla tube 1.2–1.8 mm long and ligule 2.2–3.0 mm long, broadly oval; corolla of disk florets 2–3 mm long. Achenes 1.8–2.4 mm long. Flowering August to September.

Rubbly and stony slopes, gravel beds above 1,000 m. —*Soviet Central Asia*: Tien Shan (central part). *General distribution*: Dzhungaria-Kashgaria (eastern Tien Shan). Described from Tien Shan. Type in Leningrad.

4. **B. fruticosum** (Ldb.) DC. Prodr. VI (1837) 44; Ldb. Fl. Ross. II, 540; O. and B. Fedtsch. Perech. Rast. Turk. IV, 183; Kryl. Fl. Zap. Sib. XI, 2755.—*Chrysanthemum fruticosum* Ldb. Fl. Alt. IV (1833) 117; B. Fedtsch. Rast. Turk. 736.—**lc.**: Ldb. Ic. pl. Fl. Ross. impr. Alt. V (1834) t. 495; Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI, 189, Fig. 3.

397 Perennial. Semishrub, 5–20 cm high, with many-headed woody root, finely grayish-tomentose with appressed simple and bifid hairs. Stems usually rather numerous, ascending at base or erect, woody to a considerable height, branched mainly in upper half. Leaves grayish-green from fine tomentum, with indistinct punctate glands, to 1.5(2.0) cm long and 1.5 cm wide, with rather long petiole thickened at base, lacking stipules, but sometimes with pseudostipules (of axillary bud), almost circular, palmately 3-parted, with linear-subulate, somewhat thick lobes having short cartilaginous cusp at apex, sometimes some leaves pinnately 4–5-parted (and then bases of lobes usually approximate); uppermost leaves undivided, linear. Capitula (1)3–15(20) on single stem, aggregated in lax, not always regular, simple or compound corymbs. Involucres 5–6 mm in dia and 4.5–6.0 mm long, more or less finely tomentose; involucre bracts with light or brownish membranous border, considerably wider in inner bracts. Ligulate florets (3)4–10(12), yellowish-white as in preceding species; corolla of disk florets 2–3 mm long. Achenes 1.8–2.2 mm long. Flowering August to September.

Rubbly and stony slopes; up to middle mountain zone.—*Western Siberia*: Altai (southern part); *Soviet Central Asia*: Lake Balkhash Region (eastern part). *General distribution*: Dzhungaria-Kashgaria, Mongolia (western part). Described from eastern Kazakhstan (Chingiz Mountains). Type and isotypes in Leningrad.

5. **B. kasakhorum** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 170.—**lc.**: Krasch. *ibid.* 171, fig. 8.

Perennial. Semishrub, 5–15 cm high, with many-headed woody root, finely grayish-tomentose with appressed simple and bifid hairs, sometimes weakly tomentose. Stems usually rather numerous, ascending, simple, less often with 1–2 branches. Leaves dull- or grayish-green from fine tomentum, with indistinct punctate glands, to 1(1.5) cm long and 1.3 cm wide, with rather long petiole thickened at base, almost circular; all leaves (except uppermost undivided) palmately 3-parted, with somewhat shorter than in preceding species, but linear-subulate lobes. Capitula solitary, less often 2–3 on single stem (but numerous on same plant). Involucres 4.5–6.0 mm in dia and 4–5 mm long, more or less finely tomentose, sometimes subglabrous; involucre bracts with lighter or brownish membranous border considerably wider in inner bracts. Ligulate florets 1–6, sometimes entirely absent (replaced by pistillate tubular florets), yellow, corolla tube about 0.8–1.0 mm long and broadly ovate ligule 1.2–2.0 mm long; corolla of disk florets about 2.5 mm long. Achenes 1.6–2.0 mm long. Flowering August to September.

Stony slopes, steppes; up to lower mountain zone.—*Western Siberia*: Upper Tobol (southeastern part); *Soviet Central Asia*: Aralo-Caspian Region (northeastern part); Lake Balkhash Region (northwestern part). Endemic. Described from Akmolinsk [now Tselinograd] Region (Kazakh Melkosopochnik [area of low, rounded, isolated hills]). Type and isotype in Leningrad.

GENUS 1544. *Ajania* Poljak.^{1,2}

Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 419.—*Chrysanthemum* sect. *Pyrethrum* sub-sect. *Dendranthema* (DC.) Kitam. in Acta Phyt. et Geobot. IV (1935) 477 and Compos. japon. II (1940) 350 p. p.—*Tanacetum* auct. p. p. non L.

Capitula usually numerous (2–60) aggregated at apex of stem in lax or compact corymbs, very rarely (in species of series *Tibeticae*) solitary, heterogamous but lacking ligulate florets, with relatively fewer (1–15) pistillate peripheral tubular florets, in one row, and considerably large number (15–80) of bisexual, tubular disk florets. Involucres goblet-shaped, 2.5–10.0 mm in dia and 3–7 mm long; involucre bracts

¹Treatment by N.N. Tzvelev.

²Named after the Ayan port on the Sea of Okhotsk, the neighborhood from which the species *Ajania pallasiana* was described.

herbaceous or coriaceous-herbaceous, imbricate, in 3–4 irregular rows; outer bracts linear-lanceolate to broadly ovate, obtuse or subacute, inner oblong-linear to oblong-ovate, obtuse or subobtuse, 1.5–3 times as long as outer bracts; all bracts with rather wide, membranous border, often (in inner bracts) apically broadened like appendage. Receptacle strongly or moderately convex, often obtusely conical, glabrous, very weakly punctate-tuberculate, usually distinctly alveolar, more or less filled. Corolla of pistillate tubular florets mainly similar to that of disk florets but usually smaller, more or less dorsally compressed, with 2–4 stiff teeth; corolla of disk florets yellow, 1.5–3.0 mm long, their tube quite strongly and abruptly broadened in upper half, with 5 deltoid, more or less curved teeth a sixth to a fifth as long as tube. Filaments of stamens thickened in upper part, anthers lacking distinct basal appendage, but with broadly lanceolate, acute or subobtuse apical appendage; pollen grains globose, spinulose. Style[stigma?] bifid; style branches linear, truncate. Achenes similar, glabrous, 1.0–2.2 mm long and 0.4–1.0 mm wide, almost terete, narrowed toward base, with 4–6 longitudinal veins as very indistinct, not always prominent ribs, pericarp lacking secretory canals but usually with muciferous cells in irregular rows almost all over achene; pappus entirely absent.

Perennial herbs or semishrubs, more or less covered with appressed bifid hairs, sometimes mixed with simple hairs, lacking telescoped (as rosettes of basal leaves) vegetative shoots; stem erect but basally often ascending, branched usually only at base and in inflorescence, densely leafy with alternate, usually incised, rarely (as in *A. kokanica*) entire leaves.

399 The genus contains about 25 species distributed in China, Japan, Mongolia, Korea, Afghanistan, and the northern part of India; of these, nine species are found in parts of the Soviet Union bordering these countries.

Type of genus: *Ajania pallasiana* (Fisch. ex Bess.) Poljak.

Note. The group of species belonging to this genus is very closely linked with the genus *Dendranthema* (DC.) Des. Moul. and is distinguished from the latter only by the absence of peripheral ligulate florets and by smaller capitula on the average. It is quite probable that in treating the numerous species belonging to these two genera over the vast territory of China, they generally cannot be distinguished as separate genera or the basic character distinguishing them will have to be, not the presence or absence, but the color of the ligulate florets, (analogous to the genera *Tanacetum* L. and *Pyrethrum* Zinn.). At present, however, having neither the time nor sufficient material for such a treatment, I prefer to retain both genera, which are well

distinguished over the territory of the USSR, as separate entities. Apparently, the affinity between the genera *Ajania* and *Brachanthemum* DC. is just as close, but this, too, can be examined more thoroughly only by studying materials of these two genera from China and Mongolia.

The evolution of the genus *Ajania* from ancestral forms similar to the genus *Dendranthema* in the direction of adaptation to habitats in vast expanse of steppes and deserts of Central Asia has resulted in a considerable morphological similarity of many species of *Ajania* with species of the genus *Artemisia* L. (possibly representing another line of evolution from these same ancestral forms of the *Dendranthema* type). It was not by accident that P.P. Poljakov (op. cit.), the author of the genus *Ajania*, mistakenly referred six species of arctic wormwoods (*Artemisia glomerata* Ldb., *A. senjavensis* Bess., etc.) to this genus. Despite their superficial resemblance to *Ajania pallasiana*, their compound inflorescence is transitional from capitate to racemose but not to corymbiform; the appendages of the anthers in most species are attenuate-acuminate (which is not so in species of the genus *Ajania*; and the pollen grains of all these species (according to A.A. Kuprianova) differ so sharply from those of *Ajania* species, not only in the absence of spinules on the surface but also in the structure of the tectum, that the similarity of the indicated wormwoods to the genus *Ajania* undoubtedly should just be considered convergence.

The genus *Ajania* is divided into several entirely independent series containing very close ecogeographical races, but can hardly be divided into any larger taxa such as sub-genera or sections.

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| 400 | <ol style="list-style-type: none"> 1. Leaves undivided, with sharp teeth throughout 6. A. kokanica (Krasch.) Tzvel. + Leaves more or less divided, less often 3–5-lobed 2. 2. Leaves green and glabrous or weakly hairy above, whitish- or grayish-tomentose beneath. Far East 3. + Leaves concolorous on both sides, grayish-green from profuse pubescence. Altai and Soviet Central Asia 4. 3. Plants herbaceous, leaves tomentose beneath from appressed bifid hairs; outer involucre bracts linear-lanceolate 2. A. pallasiana (Fisch. ex Bess.) Poljak. + Stem woody at base; leaves tomentose beneath from flexuous simple hairs; outer involucre bracts broadly ovate 1. A. manshurica Poljak. 4. Plants (10)15–60(90) cm high, with relatively small (2.5–4.5 mm wide) capitula aggregated in compound corymbs 5. |
|-----|---|

- + Plants 2–15 cm high, with larger (5–10 cm wide) capitula solitary or 2–8 aggregated in compact corymbs 7.
- 5. Plants 10–30 cm high; stems many from base, with thick woody caudex; capitula 4–25 on single stem, relatively large (3.0–4.5 mm in dia and 4–5 mm long). Altai, Tarbagatai, Kazakh “*melkosopochnik*” 4. **A. fruticulosa** (Ldb.) Poljak.
- + Plants 15–90 cm high; capitula 20–80 on single stem not large (2.5–4.0 mm in dia and 3.0–4.5 mm long), Tien Shan, Pamiro-Alai 6.
- 6. Stem strongly branched at base, woody to considerable height, middle and lower cauline leaves usually twice ternately divided. Pamir 5. **A. gracilis** (Hook. f. and Thoms.) Poljak.
- + Stem weakly branched at base (often solitary), almost not woody; middle and lower leaves usually bipinnate, with 5–7 lobes..... 3. **A. fastigiata** (Winkl.) Poljak.
- 7. Middle and lower cauline leaves usually pinnately cut (or parted) into 5–9 lobes, in turn, all or some 3–5-parted or lobed. Pamir .. 9. **A. tibetica** (Hook. f. and Thoms.) Tzvel.
- + Middle and lower cauline leaves palmately or almost 3–5 pinnately divided (or lobed); their lobes undivided or some 2–3-parted. Central Tien Shan 8.
- 8. Plants 2–7 cm high, with thick, woody caudex; capitula 7–10 mm in dia, often solitary 7. **A. scharnhorstii** (Rgl. and Schmalh.) Tzvel.
- + Plants 5–15 cm high, with thinner, not always woody root; capitula 5–8 mm in dia, always aggregated in corymbs 8. **A. trilobata** Poljak.

401 **Series 1. Variifoliae** Tzvel.—Stem woody at base; leaves pinnately parted, glabrous above, densely whitish-tomentose beneath with flexuous simple hairs; capitula 10–25, aggregated in compact compound corymb. Involucres 3.5–5.0 mm in dia; outer involucre bracts a half to two-thirds as long as inner bracts.

1. **A. manshurica** Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 420.—*Chrysanthemum variifolium* var. *ramosum* Chang in Sinensia V (1934) 163.—**lc.:** Poljak. op. cit. 421, fig. 2.

Perennial. Plant 15–60 cm high, base semishrubby, with thick woody root. Stem branched in lower woody part, erect, densely leafy, more or less covered with appressed bifid and simple hairs. Leaves thick, subcoriaceous, weakly revolute, lacking distinct punctate glands, glabrous and green, densely whitish-tomentose above with flexuous

simple hairs beneath; lower and middle cauline leaves to 4 cm long and 2.3 cm wide, with rather long, winged petiole, lacking auricles, more or less rhombic, 3–5 pinnately parted, with lanceolate or lanceolate-linear, 1.2–3.0 mm wide lobes, cuneately narrowed toward base; upper cauline leaves smaller, usually ternate. Capitula 10–25, with 20–40 florets, aggregated at stem apex in compound corymbs, peduncles 0.5–6.0 mm long, more or less hairy. Involucres 3.5–5.0 mm in dia and 4.0–5.5 mm long, usually hairy near base to subglabrous; involucre bracts coriaceous-herbaceous, outer broadly ovate, two-fifths to a half as long as oblong-ovate inner bracts; all bracts with rather wide, brownish membranous border. Corolla of tubular disk florets 2.2–2.6 mm long; peripheral pistillate florets usually smaller, 3–8 on each capitulum. Achenes 1.8–2.2 mm long, with unevenly raised subobtusate upper border, lacking corona. Flowering August to September.

Rocks, stony slopes; up to upper mountain zone.—*Far East*: Ussuri (basin of Suifun River). *General distribution*: China (northeastern part), Korea. Described from Far East. Type in Leningrad.

Note. It is distinguished from the very similar species *A. variifolia* (Chang) Tzvel. comb. nova (= *Chrysanthemum variifolium* Chang, op. cit. 161) from Shansi Province only by the wider lobes of the leaves and the stems that usually branch near the base.

It belongs to the group of *Ajania* species that are very close to the genus *Brachanthemum* DC.

Series 2. Pallasianae Tzvel.—Stems herbaceous; leaves pinnately parted or ternate, sometimes 3-lobed, glabrous above, less often hairy, densely tomentose beneath with appressed bifid hairs; capitula (3)5–50(60), aggregated in rather compact, compound corymb. Involucres 402 4–7 mm wide; outer involucre bracts not less than two-thirds as long as inner bracts.

2. *A. pallasiana* (Fisch. ex Bess.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 420.—*Artemisia pallasiana* Fisch. ex Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 61; DC. Prodr. VI, 116, non *A. pallasii* Spreng. 1826.—*Tanacetum pallasianum* (Fisch. ex Bess.) Trautv. and Meyer, Fl. ochot. (1856) 55, t. 27; Maxim. Prim. Fl. Amur. (1859) 163.—*Pyrethrum pallasianum* (Fisch. ex Bess.) Maxim. in Mel. biol. VIII, 2 (1872) 514.—*Chrysanthemum pallasianum* (Fisch. ex Bess.) Kom. in Tr. Peterb. Bot. Sada, XXV, 1 (1907) 645; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II (1932) 1028.—**lc.**: Trautv. and Meyer, loc. cit.; Poljak. op. cit. 421, fig. 1.—**Exs.**: GRF No. 3273.



Plate XVIII.

Habit, corolla of tubular floret, achenes: 1 — *Ajania scharnhorstii* (Rgl. and Schmalh.) Tzvel.; 2 — *Hippolytia darvasica* (Winkl.) Poljak.

Perennial. Plant 15–60 cm high, with thick, more or less branched rhizome, more or less covered with appressed bifid hairs. Stems erect, solitary or few, densely leafy, branched only in inflorescence. Leaves not always with distinct punctate glands, glabrous above or less often hairy, grayish- or whitish-tomentose beneath with appressed bifid hairs; lower and middle cauline leaves to 8 cm long and 4 cm wide, with rather long (but always shorter than lamina), winged petiole, at base often with oblong or linear lobes of axillary shoot but often adnate with base of petiole, oblong to more or less rhombic, ternate or pinnately parted, sometimes pinnately lobed, with few linear or linear-lanceolate pinnate or lobes, often in turn more or less lobed or irregularly toothed, uppermost cauline leaves strongly reduced and less divided (often 3-lobed or even undivided). Capitula (3)5–50(60) with 30–80 florets, aggregated at stem apex in rather compact, compound (less often simple) corymb, their peduncles 2–15 mm long, usually with strongly reduced subtending leaves, appressed-hairy. Involucres 4–7 mm in dia and 4–6 mm long, more or less hairy to subglabrous; involucre bracts herbaceous, outer bracts linear-lanceolate, not less than two-thirds as long as oblong and linear-oblong inner bracts; inner bracts with rather wide, light-colored or brownish membranous border. Corolla of tubular disk florets with 2.5–3.2 mm long; few peripheral pistillate florets usually smaller. Achenes 1.2–1.8 mm long and about 0.8 mm wide, with somewhat raised obtuse upper border, lacking corona. Flowering July to September. (Plate XXXI, Fig. 2).

405 Stony slopes, rocks; up to middle mountain zone.—*Far East*: Okhotsk (near Ayan), Kamchatka(?), Uda River Area, Zeya-Bureya (eastern part), Ussuri, Sakhalin. *General distribution*: China (northeastern part), Korea. Described from Okhotsk seacoast. Type in Leningrad.

Note. A highly polymorphic species, apparently breaking up into several ecogeographical races, distinguished mainly by the shape of the leaves and, to a lesser extent, by the size of the capitula and the shape of the involucre bracts. For example, in the northern Sikhote-Alin District near the city of Sovetskaya Gavan we find specimens of *A. pallasiana* with wide leaves, which are trilobate only in the upper third and have well developed auricles at the base of the petioles, while from other areas we know specimens with bipinnate leaves without auricles.

Series 3. Fruticulosae Tzvel.—Stem woody at base; leaves more or less divided or incised, concolorous on both sides, grayish from profuse pubescence of appressed bifid hairs; capitula (4)10–60(80) on single stem, aggregated in lax or compact compound corymb. Involucres

2.5–4.5 mm in dia; outer involucre bracts a third to a half as long as inner bracts.

3. **A. fastigiata** (Winkl.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk, XVII (1955) 428.—*Artemisia fastigiata* Winkl. in Tr. Peterb. Bot. Sada, XI, 12 (1891) 373; O. and B. Fedtsch. Perech. Rast. Turk. IV, 200.—*Tanacetum fastigiatum* (Winkl.) Krasch. in Spisok Rast. Gerb. Fl. SSSR, XI (1949) 40.—**Exs.:** GRF No. 3275.

Perennial. Plant 30–90 cm high, with thick, woody root, grayish from profuse pubescence of appressed bifid hairs. Stems at base almost not woody, usually few (sometimes solitary), erect, densely leafy, usually more or less branched only above. Leaves grayish-green, with numerous punctate glands; basal leaves withering early; cauline leaves to 4–5 cm long and 3–4 cm wide, with very narrow-winged petiole and linear auricles; wide deltoid-oval, bipinnate (or pinnately cut) up to narrow-winged rachis, with 5–7, less often 3 lobes; terminal lobes linear or lanceolate, to 2 mm wide, obtuse or subacute; upper cauline leaves reduced and less divided, often sessile. Capitula with 15–25 florets, 20–80 on single stem, aggregated in rather compact, compound corymbose inflorescence with multiple branched peduncles, peduncles (terminal branches of corymb) to 8 mm long, usually with very small linear subtending leaves. Involucres 2.5–4.0 mm in dia and 3.0–4.5 mm long, more or less tomentose near base; involucre bracts herbaceous, outer broadly lanceolate and ovate, with narrow membranous border, inner bracts 2–3 times as long as outer bracts, oblong-obovate, with wide, light-colored or brownish, membranous border appendiculately broadened at apex. Corolla of tubular disk florets 1.8–2.5 mm long; few peripheral pistillate florets usually smaller. Achenes 1.0–1.5 mm long and about 0.4 mm wide, lacking corona. Flowering August to September.

Stony slopes, steppes, scrubs, at 1,500 to 3,000 m. — *Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau), Tien shan, Pamiro-Alai Region (near Pamir). *General distribution*: China (western part), Afghanistan. Described from area between Alai and Peter the First ranges. Type in Leningrad.

4. **A. fruticulosa** (Ldb.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 428.—*Tanacetum fruticosum* Ldb. Ic. pl. Fl. Ross. I (1829) 10, t. 38; DC. Prodr. VI, 129; Ldb. Fl. Ross. II, 603; O. and B. Fedtsch. Perech. Rast. Turk. IV, 204 p. p.; Kryl. Fl. Zap. Sib. XI, 2758.—*Artemisia athanasia* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 24.—*Pyrethrum athanasia* (Bess.) Boiss. Fl. or. III (1875) 353, quoad. nomen.—*Chrysanthemum fruticosum* (Ldb.) B.

Fedtsch. Rast. Turk. (1915) 737. non Ldb. 1829.—*C. neofruticulosum* Ling in Contr. Inst. Bot. Ac. Sc. Peip. III (1935) 482, nom. nov.—*C. athanasia* (Bess.) B. Fedtsch. in herb.—*lc.*: Ldb. l. c.

Perennial. Plant 10–30 cm high, with thick, woody root, grayish from profuse pubescence of appressed bifid hairs. Stems woody at base, usually rather numerous, erect or basally ascending, densely leafy, weakly branched only above. Leaves grayish-green, with numerous punctate glands; basal leaves withering early; cauline leaves to 2–3 cm long and 2.5 cm wide, with rather long (sometimes as long as lamina), almost not winged petiole, usually with linear auricles, usually deltoid roundish, ternate (or divided) up to quite narrow-winged rachis, less often pinnately parted, lobes usually divided into 3–5 secondary lobes, terminal lobe narrow-linear, to 0.8–1.0 mm wide, obtuse or subacute; upper cauline leaves reduced and less divided, usually sessile or subsessile. Capitula with 15–30 florets, 4–25 on single stem, aggregated in compact, compound, corymbose inflorescence, peduncles to 10 mm long, usually with linear subtending leaves at base. Involucres 3.0–4.5 mm in dia and 4–5 mm long, glabrous or subglabrous; involucre bracts herbaceous, outer broadly lanceolate and ovate, a third to a half as long as oblong-obovate inner bracts; all bracts with wide light or brownish membranous border, appendiculately broadened at apex of inner bracts. Corolla of tubular florets with 1.8–2.8 mm long; few peripheral florets pistillate. Achenes 1.2–1.5 mm long and about 0.4 mm wide, lacking corona. Flowering August to September.

407 Stony and rubbly slopes, steppes; up to middle mountain zone.—*Western Siberia*: Irtysh (southern part), Altai (southern part); *Eastern Siberia*: Angara-Sayans (southwestern part); *Soviet Central Asia*: Lake Balkhash Region, Dzhungaria-Tarbagatai (Tarbagatai). *General distribution*: China (western part), Mongolia. Described from Altai. Type and isotype in Leningrad.

5. *A. gracilis* (Hook. f. and Thoms.) Poljak. comb. nova. in litt.—*Tanacetum gracile* Hook. f. and Thoms. Fl. Brit. Ind. III (1882) 318.—*Chrysanthemum gracile* (Hook. f. and Thoms.) B. Fedtsch. Rast. Turk. (1915) 737, non Masf. 1881.—*C. hookeri* Kitamura in Acta Phyt. et Geobot. XVII (1957) 34, nom. nov.

Perennial. Plant 15–45 cm high, with thick, woody root, grayish from abundant pubescence of appressed bifid hairs; stems strongly branched at base and woody to considerable height, usually rather numerous, erect, densely leafy. Leaves grayish-green, with numerous punctate glands; basal leaves withering early; cauline leaves to 2–3 cm long and 2.5 cm wide, with rather long, almost wingless petiole, at base with linear auricles or lacking them; their lamina usually deltoid

roundish, twice ternate up to narrowly winged rachis, terminal lobe oblong to linear, to 1.5 mm wide, subobtus; upper cauline leaves reduced, subsessile, usually 3–5 lobed. Capitula with 15–25 flowers, 20–60 on single stem, aggregated in compact compound corymbs, peduncles usually 1–5 mm, less often to 8 mm long, often with linear subtending leaves. Involucres 2.5–3.0 mm in dia and 3–4 mm long, subglabrous; involucre bracts herbaceous, with wide, light or brownish membranous border appendiculately broadened at apex; outer bracts a third to a half as long as inner bracts. Tubular florets with 1.5–2.0 mm long corolla, few peripheral florets pistillate. Achenes 1.2–1.5 mm long and about 0.5 mm wide, lacking corona. Flowering August to September.

Rocks, stony slopes; above 3,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (Pamir). *General distribution*: India (northern part), China (Tibet). Described from western Tibet. Type in London.

Note. Because of the absence of reliably identified material of this species, I am not entirely convinced of the complete identity of the Pamir specimens with the typical Tibetan specimens.

Series 4. Sedifoliae Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk. SSSR, IX (1946) 170.—Stems herbaceous; leaves undivided, sharp-toothed, dull- or grayish-green from rather profuse pubescence of appressed bifid hairs; capitula (1)2–10(12), aggregated in very compact, simple or compound corymb. Involucres 4–6 mm in dia; outer bracts usually not less than 2/3 as long as inner ones.

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6. **A. kokanica** (Krasch.) Tzvel. comb. nova.—*Tanacetum kokanicum* Krasch. in Bot. Mat. Gerb. Glavn. Bot. Sada, IV (1923) 7.—*T. aphanassievi* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 168.—*Hippolytia aphanassievii* (Krasch.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 290.

Perennial. Plant 15–40 cm high, with thick, woody root, dull- or almost grayish-green from rather profuse pubescence of appressed bifid hairs. Stems numerous, at base usually not woody, erect or basally ascending; densely leafy, branched only in inflorescence. Leaves dull- or grayish-green from rather profuse pubescence, with numerous punctate glands, sessile, lacking auricles or with small auricles at base, oblong-linear or oblong-lanceolate, up to 3 cm long and 0.8 cm wide, long-attenuate and acuminate, sharp-toothed; basal and lower cauline leaves withering early, subtending leaves strongly reduced, often up to inflorescence. Capitula many-flowered, (1)2–10(12) on single stem, aggregated in very compact, often globose, simple or compound corymb, peduncles 0.5–15(20) mm long. Involucres 4–6 mm in dia and 4–5 mm

long, at base more or less hairy; involucre bracts herbaceous, with relatively narrow, brownish or blackish-brown membranous border, outer bracts lanceolate, acute, fewer, inner bracts usually not more than 1.5 (rarely almost 2) times as long as outer bracts, linear-oblong, subobtus. Corolla of tubular florets with 1.8–2.4 mm long, few (1–5) peripheral florets usually pistillate. Achenes about 1.6 mm long and 0.6 mm wide, lacking corona. Flowering August to September. (Plate XVII, Fig. 2).

Rubby and stony slopes, talus; above 2,500 m.— *Soviet Central Asia*: Pamiro-Alai Region (Turkestan Range and western part of Alai Range). Endemic. Described from Turkestan Range. Type and isotype in Leningrad.

Note. *Tanacetum aphanassievii* Krasch., also described from the Turkestan Range, hardly deserves to be treated as a separate species, as its differences (somewhat weaker pubescence, slightly wider leaves with much longer teeth, and, on the average, more compact inflorescence) apparently are not hereditary but individual features without any taxonomic significance, related to more or less shady or more humid habitats.

Series 5. Tibeticae Tzvel.—Stems at base almost not woody; leaves more or less pinnatipartite or 3–5 lobed, grayish from profuse pubescence of appressed bifid hairs; capitula solitary at apices of stems or 2–8 aggregated in rather compact, not always regular corymbs. Involucres 5–12 mm in dia; outer involucre bracts a half to two-thirds as long as inner bracts.

- 409 7. **A. schanhorstii** (Rgl. and Schmalh.) Tzvel. comb. nova.—*Tanacetum schanhorstii* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 620; O. and B. Fedtsch. Perech. Rast. Turk. IV, 206.—*T. grigorjewii* Krassn. in Scripta bot. Hort. Univ. Petrop. II, 1 (1887–1888) 16; O. and B. Fedtsch. op. cit. 206.—*Chrysanthemum schanhorstii* (Rgl. and Schmalh.) B. Fedtsch. Rast. Turk. (1915) 738.—*C. grigorjewii* (Krassn.) B. Fedtsch. op. cit. 738.—*Hippolytia schanhorstii* (Rgl. and Schmalh.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 289.

Perennial. Plants 2–7 cm high, with thick, woody, many-headed root, grayish from profuse pubescent of appressed bifid hairs. Stems numerous from base, herbaceous, erect to almost prostrate, densely leafy, simple or branched only inflorescence. Leaves grayish or whitish from profuse pubescence, with numerous punctate glands less distinct because of pubescence; basal leaves withering early; lower and middle cauline leaves to 1.3 cm long and 1.0 cm wide, with rather long (but

usually shorter than lamina), narrow-winged petiole, lacking auricle at their base, broadly ovate to reniform, usually cuneately narrowed toward base, 3–5 palmately or pinnately parted, their terminal lobe ovate to broadly linear, often distinctly broadened in upper half, obtuse and often divided into 2–3 secondary lobes; upper cauline leaves usually ternate or three-lobed, smaller. Capitula solitary, on more or less tomentose, to 1 cm long peduncles, or 2–4 on single stem, aggregated in compact, not always regular corymb. Involucres 7–10 mm in dia and 6–7 mm long, finely tomentose near base; involucre bracts herbaceous, outer bracts broadly lanceolate or lanceolate-ovate, with narrow membranous border, inner bracts 1.5–2 times as long as outer bracts, oblong or ovate, with very wide, brownish, less often light-colored membranous border appendiculately broadened at apex. Corolla of tubular florets 2.2–3.0 mm long, few (1–6) peripheral pistillate florets. Achenes 1.6–2.2 mm long and about 0.6–0.8 mm wide, lacking corona. Flowering July to August. (Plate XVIII, Fig. 1).

Stony and rubbly slopes, gravel beds; above 3,000 m.—*Soviet Central Asia*: Tien Shan (central part). *General distribution*: China (Tien Shan). Described from Central Tien Shan. Type in Leningrad.

Note. Like the following two species, this species is very closely linked to the species of the series *Fasciculatae* Tzvel., being their high-mountain derivative. Apparently, it was erroneously referred to the genus *Hippolytia* Poljak. by P.P. Poljakov (op. cit.).

8. **A. trilobata** Poljak. sp. nova in Addenda, XXV, 880.

Plant 5–15 cm high, with root thinner than in previous species, not
410 always woody, grayish from profuse pubescence of appressed bifid hairs. Stems numerous from base, herbaceous, erect or ascending, branched only in inflorescence. Leaves like previous species but, on the average larger and less dense. Capitula (1)3–8(10) on single stem, aggregated in compact simple or compound corymb. Involucres (4.5)5–7(8) mm in dia and 5.0–6.5 mm long, more or less tomentose near base; involucre bracts like in previous species. Corolla of tubular florets 2.2–3.0 mm long, few (1–8) peripheral florets pistillate. Achenes like in previous species. Flowering July to August.

Gravel beds, stony slopes, above 2,500 m.—*Soviet Central Asia*: Tien Shan (central part). *General distribution*: China (Tien Shan). Described from Central Tien Shan. Type (basin of Sarydzhas River, slopes below Nansen Peak, height 2,950 m, 29.VII.1955, M. Grudzinskii) in Leningrad.

Note. In relation to the previous species, it is, on the average, a much lower mountain ecogeographical race confined to more wet (usually gravelly) habitats and is linked to it by specimens having capitula that are intermediate in size and number.

9. **A. tibetica** (Hook. f. and Thoms.) Tzvel. comb. nova.—*Tanacetum tibeticum* Hook. f. and Thoms. in Clarke, Compos. Ind. (1876) 154; O. and B. Fedtsch. Perech. Rast. Turk. IV, 204.—*T. nanum* auct. non Clarke: O. and B. Fedtsch. ibid. 204.—*T. tenuifolium* auct. non Jacq.: O. and B. Fedtsch. ibid. 206.—*T. xylorrhizum* Krasch. ex Stanjuk. Rast. Pokr. Vost. Pamira (1949) 53, diagnosis in Russian—*Chrysanthemum tibeticum* (Hook. f. and Thoms.) Hoffm. in Pauls. Pl. coll. in Asia med. and Pers. (1903) 149; B. Fedtsch. Rast. Turk. 737.—*C. nanum* auct.: B. Fedtsch. ibid., non *Tanacetum nanum* Clarke.—*C. tenuifolium* auct.: B. Fedtsch. ibid. 738, non *Tanacetum tenuifolium* Jacq.—Ic.: Pampanini, Fl. Caracorum (1930) t. VII, fig. 1; Stanjukovicz, op. cit. 98.

Perennial. Plant 2–10 cm high, with thick, woody, many-headed root, grayish from profuse pubescence of appressed hairs; stems numerous from base, usually herbaceous, erect or ascending, densely leafy, simple or apically branched. Leaves grayish from profuse pubescence, with punctate glands less distinct because of pubescence; basal leaves withering early, lower and middle cauline leaves to 1.5 cm long and 1.2 cm wide, with rather long, narrow-winged petiole, often with linear auricles, ovate to reniform, more or less narrowed toward base, usually pinnately parted in 5–9 lobes, of which all or some 3–5 lobed or divided, terminal lobe oblong to almost semicircular, on the average shorter than in previous species, obtuse; upper cauline leaves like others but smaller, usually not palmately 3-lobed or palmately 3-parted. Capitula solitary on up to 1.5 cm long peduncles, or 2–8 on single stem, aggregated in compact, simple or compound
411 corymb. Involucres 5–9 mm in dia and 5–6 mm long, more or less tomentose; involucre bracts herbaceous, outer bracts lanceolate-ovate, inner bracts ovate, 1.5–2 times as long as outer bracts; all bracts with wide, brownish, less often light-colored membranous border. Corolla of tubular florets 2.2–3.0 mm long, few peripheral florets pistillate. Achenes 1.6–2.2 mm long and about 0.6–0.8 mm wide, lacking corona. Flowering July to August.

Stony and rubbly slopes, gravel beds, above 3,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (Pamir and Trans-Alai ranges). *General distribution*: China (Tibet), India (northern part), Afghanistan (northeastern part). Described from Tibet. Type in London; isotype in Leningrad.

Note. In our circumscription, *A. tibetica* is quite distinctly divided into two ecological forms linked through intermediate plants, but possibly they are separate ecogeographical races (analogous to *A. scharnhorstii* and *A. trilobata*); the typical form, associated with the stony and rubbly slopes of river valleys, is small, with a thick woody

root and larger, often solitary, capitula, and the form of river gravel beds has a thinner, often herbaceous root, taller stem and smaller capitula, always aggregated in corymbs. In habit, the latter form approaches the closely related Himalayan species *A. tenuifolia* (Jacq.) Tzvel. comb. nova (*Tanacetum tenuifolium* Jacq. in DC. *Prodr.* VI, 129) but is, nevertheless, distinguished from it by wider leaf lobes and also, on the average, by shorter plants.

GENUS 1545. *Hippolytia* Poljak.^{1,2}

Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 288 p. p.—*Tanacetum* auct. p. p. non L.

Capitula usually numerous (2–15), aggregated at stem apex in compact or lax corymbs, less often solitary, homogamous, with numerous bisexual, tubular disk florets. Involucres goblet-shaped, 6–12 mm in dia and 5–8 mm long; involucre bracts herbaceous or coriaceous-herbaceous, imbricate, in 3–4 irregular rows, outer broadly lanceolate to lanceolate-ovate with relatively narrow, membranous border, inner 1.5–2 times as long as outer bracts, oblong-linear to oblong-ovate, with wider membranous border appendiculately broadened at apex; innermost bracts sometimes reduced, linear, almost lacking border. Receptacle moderately convex, filled glabrous, very weakly punctate-tuberculate, usually distinctly alveolate. Corolla of
 412 tubular disk florets yellow, 2.5–3.6 mm long, tube strongly and abruptly broadened in upper half, with 5 lanceolate-triangular teeth, a fifth to a fourth as long as tube; anther filaments thickened in upper part; anthers lacking distinct basal appendage, but with lanceolate-ovate, subobtusely apical appendage; pollen grains globose, spinulose; style[stigma] bifid, style branches linear, truncate. All achenes similar, glabrous, 2.0–3.2 mm long and 0.6–0.8 mm wide, almost terete, narrowed toward base, with 4–7 very inconspicuous longitudinal veins as indistinct ribs and very loose pericarp; pappus entirely lacking but upper border of achenes often raised in as obtuse, annular ridge.

Perennial herbs, more or less covered with appressed bifid hairs, sometimes transitional to simple hairs, with condensed nonflowering shoots (as rosette of basal leaves); stems erect or ascending, more or less branched only at base and apex, sparsely leafy, leaves alternate with divided lamina.

¹Treatment by N.N. Tzvelev.

²Named after the renowned botanist Ippolit Mikhailovich Krascheninnikov, who worked on the systematics of the tribe Anthemideae.

The 12–15 species of this genus are distributed in the alpine regions of Central and Soviet Central Asia, from the Dzhungarian Alatau in the north to the Himalayan Mountains in the south; four species are found in the USSR.

Type of genus: *Hippolytia darvasica* (Winkl.) Poljak.

Note. Of the nine species proposed by P.P. Poljakov (op. cit.), the author of this genus, in his original description, three, viz. *H. scharnhorstii* (Rgl. and Schmalh.) Poljak., *H. trifida* (Turcz.) Poljak., and *H. aphanassievii* (Krasch.) Poljak., which with heterogamous capitula and an entirely different habit (densely leafy stems without condensed vegetative shoots) are referred by me to the genus *Ajania* Poljak., one more very distinct species—*H. kaschgarica* (Krasch.) Poljak., whose systematic position is not yet clear to me, should also be removed from the genus *Hippolytia*. Many closely related species from Tibet and the Himalayan Mountains (*Tanacetum senecionis* (Jacq. ex Bess.) J. Gay, *T. nanum* Clarke, *T. longifolium* Wall., etc.) undoubtedly belonging to the genus *Hippolytia*, although not included in P.P. Poljakov's list, must also be added to the remaining five species. In such a somewhat modified circumscription *Hippolytia* is a rather separate genus and shows a much closer affinity with the genera *Dendranthema* and *Ajania*, occupying a place analogous to that occupied by the genus *Cancrinia* Kar. and Kir. in relation to the genera *Pyrethrum* Zinn. and *Tanacetum* L.

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|-----|----|---|----|
| | 1. | Involucral bracts thicker, coriaceous-herbaceous, outer lanceolate-ovate, inner oblong-ovate. Western Pamir | 2. |
| 413 | + | Involucral bracts herbaceous, outer broadly lanceolate, inner oblong-linear. Tien Shan, Alai, Dzhungarian Alatau | 3. |
| | 2. | Leaves usually dull green, bipinnate into relatively broad (1–3 mm wide) lobes; capitula solitary, less often 2–3 on single stem; border of involucral bracts usually light-colored | 4. |
| | | 4. H. schugnanica (Winkl.) Poljak. | |
| | + | Leaves grayish from profuse pubescence, bipinnate (or divided) into narrower (0.5–2.0 mm wide) lobes; capitula (2)5–10(15) on single stem, aggregated into corymb; border of involucral bracts usually brownish, less often light-colored | 3. |
| | | 3. H. darvasica (Winkl.) Poljak. | |
| | 3. | Leaves dull green, on the average more divided. Western Tien Shan | 1. |
| | | 1. H. megacephala (Rupr.) Poljak. | |
| | + | Leaves grayish from profuse pubescence, on the average less divided | 2. |
| | | 2. H. herderi (Rgl. and Schmalh.) Poljak. | |

1. *H. megacephala* (Rupr.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 289.—*Artemisia megacephala* Rupr. in Osten-Sacken and Rupr. Sertum tiansch. (1869) 52; O. and B. Fedtsch. Perech. Rast. Turk. IV, 198.—*Tanacetum capusii* Franch. Pl. turkest. (1883) 85, t. 16; O. and B. Fedtsch. Rast. Turk. (1913) 738.—*C. glomeratum* Saposhn. in herb.—**lc.**: Franch. op. cit.

Perennial. Plant 10–35 cm high, with thick woody rhizome producing stems and condensed nonflowering shoots, more or less covered with appressed bifid hairs. Stems few or solitary, ascending or erect, weakly leafy, branched only at apex (in inflorescence). Leaves dull green, relatively sparsely hairy (to subglabrous), with indistinct punctate glands; basal leaves to 8–12 cm long and 4 cm wide, with rather long (often longer than lamina) petiole strongly thickened at base, broadly obovate to almost round, twice pinnately cut (or divided) up to narrowly winged rachis with 2–4 pairs of approximate lateral lobes; terminal lobes oblong to linear, usually to 1.5 mm, in plants from shady places up to 3 mm wide, subobtuse or subacute; cauline leaves few, reduced, with short petiole or sessile, usually pinnately parted or pinnately lobed; uppermost leaves undivided. Capitula (1)3–12(15), aggregated at stem apex into compact, often subglobose, simple or compound corymb, with up to 1 cm, less often up to 2 cm long peduncles. Involucre 7–11 mm in dia and 5–7 mm long, usually finely tomentose near base; involucre bracts herbaceous, outer broadly lanceolate with narrow, dark brown or brownish, membranous border; inner oblong-linear, with wide border of same color, appendiculately broadened at apex. Corolla of tubular florets 2.8–3.6 mm long. Achenes 2.5–3.2 mm long and about 0.6–0.8 mm wide, lacking corona. Flowering July to August.

Rocks, stony slopes, above 2,000 m.—*Soviet Central Asia*: Tien Shan (Chatkal, Pskem, Ugam, Talass Alatau, Kirgiz, Fergana ranges). Endemic. Described from Fergana Range. Type in Leningrad.

Note. This species is very similar to the Himalayan species *H. senecionis* (Jacq. ex Bess.) Poljak. comb. nova in litt. (= *Artemisia senecionis* Jacq. ex Bess. in *Bull. Soc. Nat. Mosc.* IX (1836) 75; *Tanacetum senecionis* (Jacq. ex Bess.) J. Gay in *DC. Prodr.* VI (1837) 129). However, the two specimens of the latter species (including an isotype or very badly preserved type specimen) in the Herbarium of the Botanical Institute are not entirely identical with the herbarium specimens of *H. megacephala*, a fact which, given the considerable gap between the range of these two species, can serve as a basis for retaining *H. megacephala* as a separate species, at least until we have more abundant comparative material of the similar Himalayan species.

2. **H. herderi** (Rgl. and Schmalh.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XVIII (1957) 289.—*H. leucophylla* (Rgl.) Poljak. ibid.—*Tanacetum herderi* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 619; O. and B. Fedtsch. Perech. Rast. Turk. IV, 206.—*T. leucophyllum* Rgl. in Tr. Peterb. Bot. Sada, VII, 2 (1881) 551; O. and B. Fedtsch. op. cit. 206.—*T. tomentosum* auct. non DC.: Rgl. and Herd. in Bull. Soc. Nat. Mosc. XL, 3 (1867) 128.—*Chrysanthemum herderi* (Rgl. and Schmalh.) Minkw. and Knorr. Rast. Chimk. Uezda (1910) 112; B. Fedtsch. Rast. Turk. (1915) 738.—*C. leucophyllum* (Rgl.) B. Fedtsch. ibid. **lc.:** Rgl. in Garten-flora, XXX (1881) 358, t. 1064.

Perennial. Plant 10–30 cm high, with thick woody rhizome producing stems and condensed vegetative shoots, grayish from fine lax tomentum of bifid hairs, in some plants transitional to simple hairs. Stems usually few, ascending or erect, sparsely leafy, more or less branched only at apex. Leaves grayish from profuse pubescence, with inconspicuous punctate glands, leaves as in previous species, but on the average less divided. Capitula (1)3–10(15), aggregated at stem apex into rather compact, simple or compound corymb, sometimes (apparently, under unusual habitat conditions) more lax, and then peduncles to 3 cm long. Involucres 7–12 mm in dia and 5–7 mm long, on the average more [densely] tomentose than in previous species; involucre bracts herbaceous, with wide, dark brown, membranous border. Corolla of tubular florets 2.8–3.5 mm long. Achenes 2.5–3.2 mm long and about 0.6–0.8 mm wide, lacking corona. Flowering July to August.

415 Rocks, stony slopes; above 2,500 m.—*Soviet Central Asia*: Tien Shan (central part), Dzhungaria-Tarbagatai (Dzhungarian Alatau), Pamiro-Alai Region (Alai and Trans-Alai ranges). *General distribution*: Dzhungaria-Kashgaria (western part). Described from Trans-Ili Alatau. Type and isotype in Leningrad.

Note. I do not find any significant difference between *H. herderi* and *Tanacetum leucophyllum*, described from eastern Tien Shan (Kash River). These species are identical in the nature of their pubescence and the size of their capitula, and individuals of *H. herderi* with longer capitular peduncles (f. *racemigera* Poljak. in litt.) apparently have no taxonomic significance.

3. **H. darvasica** (Winkl.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 289.—*Tanacetum darvasicum* Winkl. in Tr. Peterb. Bot. Sada, XI (1890) 317; O. and B. Fedtsch. Perech. Rast. Turk. IV, 205.—*Chrysanthemum darvasicum* (Winkl.) B. Fedtsch. Rast. Turk. (1915) 738.

Perennial. Plant 10–50 cm high, with thick, many-headed rhizome producing stems and condensed nonflowering shoots, grayish from profuse pubescence of appressed bifid hairs. Stems usually few, often as if axillary in relation to strongly condensed nonflowering shoots, ascending or erect, sparsely leafy, branched at apex (in inflorescence). Leaves grayish-green from rather profuse pubescence, with numerous punctate glands; basal leaves to 8–10 cm long and 4 cm wide, with long (often 1.5 times as long as lamina), basally strongly thickened and profusely hairy petioles; obovate or broadly oval, twice pinnately parted (or cut) up to narrow-winged rachis, with 2–4 pairs of lateral lobes, terminal lobes (of second order) lanceolate to linear, 0.5–2.0 mm wide, subobtusate or subacute, sometimes in turn 2–4-lobed (or parted); cauline leaves few, reduced, with short petiole or sessile, cuneately narrowed toward base, less divided. Capitula (2)5–10(15), aggregated at stem apex into compact or lax, compound corymb, peduncles of capitula to 4 cm long. Involucres 6–10 mm in dia and 6–8 mm long, usually only at base finely tomentose. Involucral bracts coriaceous-herbaceous; outer lanceolate-ovate, with very narrow membranous border, inner oblong-ovate, with wide, brownish, less often light-colored, membranous border, appendiculately broadened at apex. Corolla of tubular florets 2.5–3.2 mm long. Achenes 2.0–2.8 mm long and about 0.6 mm wide, lacking corona. Flowering July to August. (Plate XVIII, Fig. 2).

Rocks, stony slopes, above 2,000 m.—*Soviet Central Asia*: Pamiro-Alai Region (Darvaz and Shugnan). *General distribution*: Afghanistan (northern part). Described from Darvaz Range. Type and isotype in Leningrad.

416 **Note.** It is distinguished from the similar Himalayan species *H. tomentosa* (DC.) Tzvel. comb. nova (= *Tanacetum tomentosum* DC. *Prodr.* VI, 130) by larger capitula and, on the average, wider leaf lobes. There is an isotype of *H. tomentosa* in the Herbarium of the Botanical Institute of the Academy of Sciences of the USSR.

4. ***H. schugnanica*** (Winkl.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 289.—*Tanacetum schugnanicum* Winkl. in Tr. Peterb. Bot. Sada, XI (1890) 319; O. and B. Fedtsch. Perech. Rast. Turk. 205.—*Chrysanthemum schugnanicum* (Winkl.) B. Fedtsch. Rast. Turk. (1915) 738.

Perennial. Plant 15–40 cm high, with thick, many-headed rhizome producing strongly condensed nonflowering shoots as if forked in relation to stems, dull- or grayish-green from rather profuse pubescence of appressed bifid (in some, transitional to simple) hairs. Stems usually few or solitary, basally ascending, sparsely leafy, simple or with few

lateral branches in upper part. Leaves usually dull-green from rather profuse pubescence, with numerous punctate glands, leaves as in previous species but less divided (lobes of basal leaves often pinnately or palmately lobed), terminal lobe oblong-lanceolate to broadly linear, 1–3 mm wide, subacute. Capitula solitary or 2–3 at stem apex, on rather long (to 4–5 cm) peduncle. Involucres 7–11 mm in dia and 6–8 mm long, usually finely tomentose; involucre bracts coriaceous-herbaceous, all bracts with rather wide, usually light-colored membranous border. Corolla of tubular florets 2.5–3.2 mm long. Achenes 2.0–2.8 mm long and about 0.6 mm wide, lacking corona. Flowering August to September.

Rocks, stony slopes, at 1,500–2,500 m.—*Soviet Central Asia*: Pamiro-Alai Region (between Darvaz and Shugnan ranges). *General distribution*: Iran-Afghanistan? (Afghanistan). Described from the above mentioned area. Type in Leningrad.

Note. In relation to the previous species, it apparently is a lower altitude ecogeographical race. However, it is not ruled out that typical specimens of this species are random, broader leaved plants of secondary flowering, which belong to *H. darvasica*. It is necessary to have more extensive material for a definitive solution of this question.

GENUS 1546. *Filifolium* Kitamura^{1,2}

Kitamura in Acta Phyt. et Geobot. IX (1940) 157.

- 417 Capitula (1)2–10(15), on short erect peduncles, aggregated into simple or compound corymbose inflorescence, heterogamous, but lacking ligulate florets, with one row of (1–10) fertile pistillate florets and numerous (about 30–40) bisexual but usually sterile (with more or less rudimentary pistil) disk florets bonded together into compact mass by resinous secretions of punctate glands. Involucres goblet-shaped, 4–5 mm in dia and 4–5 mm long; involucre bracts imbricate, in 3 irregular rows, coriaceous-herbaceous, with rather wide, brownish membranous border; outer bracts ovate-roundish, middle and inner broadly elliptical, 1.5 times as long as outer. Receptacle strongly convex, obtusely conical, almost as long as wide, full, glabrous, very indistinctly alveolate. Corolla of peripheral pistillate florets tubular, dorsally compressed and distinctly narrowed at apex, with 2–4 very

¹Treatment by N.N. Tzvelev.

²From the Latin words *filum*—thread, and *folium*—leaf; so named for the very narrow (almost filiform) leaf lobes.

short, obtuse teeth; corolla of bisexual disk florets also tubular, yellowish, apically not broadened, with 5 (less often 4) broadly deltoid acute teeth. Anthers basally obtuse, with lanceolate-ovate, subobtuse apical appendage; Styles[stigmas] short, bifid; style branches linear or oblong. All achenes similar, glabrous, 1.8–2.5 mm long, globose-obovoid, strongly compressed dorsally, with 2 distinct (sometimes narrowly winged) lateral ribs, finely and indistinctly longitudinally sulcate, slightly narrowed toward base, lacking pappus (corona), but often with acute, more or less truncate upper border, pericarp very slippery when soaked.

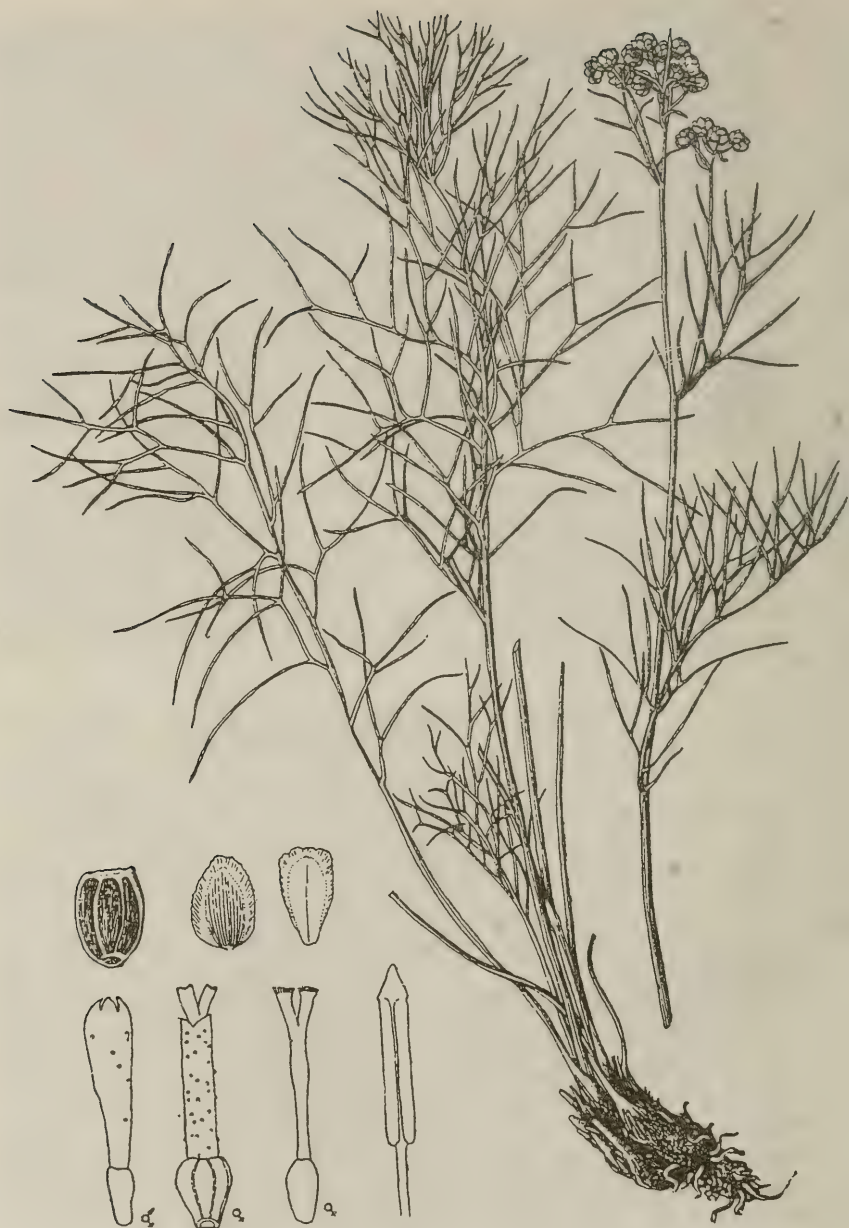
Wholly glabrous perennial plants, base of shoots profusely covered with fibrous remnants of old petioles, relatively sparsely leafy erect stems, condensed vegetative shoots and 2- (sometimes 3-) pinnately cut alternate leaves with almost filiform terminal lobe.

A monotypic East Asiatic genus.

Note. It occupies a rather distinct position in the tribe Anthemideae, being closest to the genus *Artemisia* L. It belongs to the group of wind-pollinated plants and like the genus *Artemisia* L. it is distinguished from the genera *Tanacetum* L. and *Ajanía* Poljak., aside from the peculiarities of the structure of the capitula and the achenes, also by the nonspiculose pollen grains.

1. **F. sibiricum** (L.) Kitamura, op. cit., p. 157.—*Tanacetum sibiricum* L. Sp. pl. (1753) 844; DC. Prodr. VI, 129; Ldb. Fl. Ross. II, 603; Turcz. Fl. baic. dahur. II, 75; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1032.—*Artemisia sibirica* (L.) Maxim. in Mém. Biol. VIII (1872) 524.—*Chrysanthemum trinioides* Hand.-Mazz. in Acta Horti Goteoburg. XII (1938) 273, nom. nov.—**lc.:** Gmel. Fl. Sib. II (1749) 134, t. 65, fig. 2.—**Exs.:** GRF No. 1118.

418 Perennial. Plant 20–60 cm high, with thick oblique rhizome, wholly glabrous. Stems solitary or few, basally covered with thick layer or fibrous remnants of old petioles, erect, obtusely ribbed, branched usually only at apex (in inflorescence). Leaves dull green; basal leaves to 20 cm long and 5.0–6.6 mm wide, with long petiole, not longer than lamina, obovate to linear-oblong, 2-(sometimes thrice-) pinnately cut, terminal lobe linear-filiform, to 1 mm wide and 4 cm long, more or less revolute, subacute; cauline leaves 1–5, like basal leaves but smaller and with shorter petiole (to sessile and entire uppermost leaves). Capitula 1–10 (less often to 15), usually aggregated in rather compact, simple or compound corymbs, peduncles to 1 cm long. Involucres 4–5 mm in dia and 4–5 mm long. Corolla of bisexual florets yellowish, 1.8–2.4 mm long, in pistillate florets usually somewhat smaller. Achenes pale brownish, 1.8–2.5 mm long and 1.5–2.0 mm wide. Flowering July to September. (Plate XIX).



Stony slopes, steppes, forest glades, up to lower mountain zone.—*Eastern Siberia*: Angara-Sayans, Dauria; *Far East*: Zeya-Bureya, Ussuri. *General distribution*: Mongolia, China (northeastern part), Korea. Described from Eastern Siberia. Gmelin's figure cited above is type specimen.

GENUS 1547. *Cotula* L.^{1,2}

L. *Sp. pl.* (1753) 892.

Capitula many-flowered, small, yellow; tubular florets heterogamous, peripheral female florets lacking ligule, homogenous, with compressed tube, often at base with 2 spurs and 4-notches. Receptacle smooth, lacking pales, after fruit-setting with papillae (stalks), more or less distinct. Achenes flat-compressed, wide, along edges glabrous, lacking papillae; outer achenes with stalk, achenes of central tubular florets often sessile, narrow.

Leaves toothed, pinnate or bipinnate, with narrow lobes; branches terminating in peduncles with solitary capitula. Annual, small, branched herbs.

All species of this genus (about 75) are found mainly in the Southern Hemisphere, most of them originating from South Africa (in the USSR one introduced species), a smaller number from Australia and South America.

421 The achenes of most species of this genus are inadequately and incompletely described.

1. *C. coronopifolia* L. *Sp. pl.* (1753) 892; DC. *Prodr.* VI, 78; Roth in *Engl. Bot. Jahr.* 5, 337; Hegi, *Ill. Fl.* VI, 2, 622.—*lc.*: Hegi, *op. cit.* fig. 335; Rchb. *lc. Fl. Germ.* XVI, t. 998.

Annual. Stems weak, erect or procumbent, simple or branched from base. Leaves lanceolate-linear or lanceolate, entire, toothed or pinnate, with linear, narrow, small toothed segments, obtuse or short-acuminate, at base amplexicaul; upper leaves narrow, linear, entire. Capitula solitary at apices of stems and branches; receptacle hemispherical, covered with papilliform outgrowths (stalks). Involucral bracts few, elliptical, obtuse, green or reddish with narrow, white, membranous border, glabrous. Peripheral female florets one-whorled with long, compressed, slender stalks; ovary large, with wide, white edges; corolla scarcely visible in depression of ovary; tubular disk

¹Treatment by E.G. Pobedimova.

²From the Greek word *cotule*—palm; so named for the form of the leaves.

florets with long tube (2 times as long as narrow achene), with 4 short roundish teeth; anthers and styles inserted in corolla tube. Achenes of peripheral florets 1.0–1.25 mm long and 0.75–1.0 mm wide, flat, compressed, with white broad ribs, along border; achenes of disk florets narrower, oblong, 0.75–1.0 mm long, and 0.25–0.5 mm wide; all achenes smooth, dorsally with papilliform stalk, lacking pappus. Flowering July to August. (Plate VI, Fig. 3).

Along seacoasts, mainly in muddy-marshy low-lying areas.—*Far East*: Ussuri, Sakhalin. *General distribution*: Scandinavia, Atlantic Europe, Western Mediterranean, North and South America, Australia, Africa. Described from South Africa. Type in London.

GENUS 1548. *Centipeda* Lour^{1,2}

Lour, Fl. Cochinch. II (1790) 492; Benth. and Hook. Gen. pl. II (1873–1876) 430; O. Hoffm. in Pflzfam. IV, 5 (1897) 280.—*Myriogyne* Less. in Linnaea, VI (1831) 219.

Capitula solitary, 2.5–8.0 mm in dia, many-flowered, heteromorphic, globose, subsessile in racemes at apices of branches and in axils of pseudo-opposite leaves. Involucre hemispherical; involucre bracts biseriate, imbricate, oblong or obovate, scarious, along margin hyaline, greenish in middle, upright, concave, ventrally glabrous, dorsally with sparse glandular pubescence. Receptacle flat or hemispherical, glabrous. Florets greenish or reddish, very small, regular, tubular, with very short corolla tube shorter than
422 ovary; peripheral florets pistillate, fertile, numerous, with very narrow tube and 2–3-lobed narrow limb, central florets bisexual, fertile, few (4–8), campanulate, with 4-lobed very short limb; stamens 4, anthers connate into tube surrounding style, with short, undivided, subsessile basal appendage; style short, wide; stigma bifid, lobes short, truncate; ovary oblong. Achenes oblong, angular, with 4, less often 3–5 obtuse ribs, with crisped glandular pubescence of hairs, lacking pappus. Leaves alternate, approximate, narrowed toward base, spatulate, oblong or oblong-obovate, undivided or toothed at apex. Annual or perennial herbs, glabrous or with whitish-grayish pubescence.

Of the five species of this genus, three grow in Australia, and one has been reported from Chile. Only one species is found in the USSR.

¹Treatment by L.A. Smoljaninova.

²Named for the habit of the plant; the numerous branches of the plant are procumbent on the ground.

1. **C. orbicularis** Lour, Fl. Cochinch. II (1790) 493; Maxim. Prim. Fl. Amur. 163; Kom. Fl. Manchzh. III, 650.—*Myriogyna minuta* Less. in Linnaea, VI (1831) 219.

Annual. Stem to 10 cm high, elongate procumbent or assurgent, strongly branched, glabrous or weakly silky pubescent at apex. Leaves 6–17 mm long and 2–4 mm wide, evenly distributed, alternate, oblong, entire or with 2–4 teeth in upper part, subobtusate or acuminate, cuneately narrowed toward base, glabrous. Capitula small, 2 mm long and 2–4 mm in dia, heteromorphic, hemispherical, solitary, axillary, subsessile. Outer involucral bracts 1.5 mm long and 0.5 mm wide, obovate, white, membranous, along margin hyaline, light green in middle, ventrally glabrous, dorsally with sparse, long, appressed, glandular hairs, unevenly small-toothed; inner bracts 1 mm long and 0.5 mm wide. Receptacle hemispherical, glabrous. Pistillate florets 0.25 mm long, much shorter than ovary, with small, greenish, 3-lobed limb; style as long as corolla, flattened, glabrous; stigma bifid, weakly exerted from corolla tube, stigma lobes ovoid, short, flattened, erect, approximate, papillate; ovary 1 mm long and 0.3 mm wide, oblong, slightly curved, narrowed toward base, with 3–4 ribs, with stalk, at apex with 3 fleshy thick, short, indistinct lobes, with small glandular hairs on ribs, with sparse, long, erect, apically curved glandular hairs on surface; bisexual florets few, their corollas 0.5 mm long, 4-lobed, lobes ovate, erect, reddish, glandular along margin; style 0.5 mm long and 1.2 mm wide, subellipsoidal, flattened, glabrous; stigma bifid, with small papillae, stigma lobes short, flattened, upward directed, weakly divergent, falcately incurved; ovary 1 mm long and 0.3 mm wide, oblong, narrowed toward base, with short stalk, at apex with 4 fleshy, short lobes, each
423 with one short glandular hair at apex, with occasional, erect and squarrose hairs curved at their ends; stamens 4, anthers 0.3 mm long, connate into tube surrounding style, roundish, apically truncate, with very short, undivided basal appendage, subsessile; anther filaments flattened, free, glabrous. Achenes 1 mm long, oblong, with 3–4 ribs, with small glandular hairs along ribs, on body with occasional, long glandular hairs curved at apex. Flowering July to August.

Muddy shoals of banks of rivers, lakes and streams, marshes, as weed on wet and clayey arable lands, roadside ditches and fields.—*Far East*: Uda River Area, Ussuri, Zeya-Bureya. *General distribution*: Madagascar Island, Mascarene Islands, peninsular Indochina (Burma, Malaya), Indonesia, New Caledonia Island, northern Australia, New Zealand, Philippine Islands (Luzon Island), Tahiti Island, China (Taiwan Island, provinces: Kwangtung, Fukien, Shansi, Shantung, northeastern provinces of Yunnan), Japan, Korea, Mongolia. Described from Indochina. Type in London.

GENUS 1549. *Kaschgaria* Poljak.^{1,2}

Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 282.

Capitula ovoid, diversiflorous; involucre narrow cup-shaped, 2–4 whorled, imbricate. Receptacle convex, conical, glabrous. Florets heterogeneous, peripheral florets 3–5, pistillate, their corolla narrowly tubular, broadened toward base, with 2–3 teeth, lobes of stigma linear, acute, divergent; disk florets 11–17, bisexual, their corolla tubular, 5-toothed, sparsely stellate-hairy; anthers lanceolate-linear, apical appendages of anthers acute, angular, basal appendages short, subobtusate; stigma lobes short, linear, weakly thickened above, short ciliate, after anthesis divergent. Achenes ovate, with flattened apex, with small uneven border. Pappus absent. Low semishrubs with simple, linear partly ternate, pinnately cut leaves.

The genus includes two species distributed in lower mountains, partly in western Mongolia, western China (Sinkiang) and eastern Kazakhstan.

Type of genus: *Kaschgaria brachanthemoides* (Winkl.) Poljak.

- 424 1. Fertile branches usually strongly branched, with more or less long, divergent shoots; leaves mostly narrow, lanceolate-linear, simple; capitula clustered in fascicle 1. **K. brachanthemoides** (Winkl.) Poljak.
+ Stems with rather short branches; most leaves ternate or pinnatisect, with wide lobes; capitula in compact corymbose or partly fascicular inflorescence 2. **K. komarovii** (Krasch.) Poljak.

1. **K. brachanthemoides** (Winkl.) Poljak. comb. nov.—*Artemisia brachanthemoides* Winkl. in Tr. Peterb. Bot. Sada, IX, 2 (1886) 422; B. Fedtsch. Perech. Rast. Turk. IV, 200.—*Tanacetum brachanthemoides* (Winkl.) Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, I (1933) 175; Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX, 168.

Cultivated. Smooth semishrub, 40–55 cm high. Tap root woody, thick, producing perennial, woody, short, strongly branched stem, like branches covered with grayish, cracking bark; fertile branches numerous, upright, 20–35 cm long, slender, angular-ribbed, in lower part stiff, virgate, stramineous, smooth, light green above, repeatedly branched with long, slender, divergent leafy branches. Leaves simple, sessile,

¹Treatment by P.P. Poljakov.

²Named after the old name of the Chinese province—Kashgar, with which the distribution of the genus is linked.

longitudinally rugose, glabrous or with sparse stellate hairs, narrow-lanceolate-linear, linear, or narrow-oblong-linear, short-cuspidate, usually entire, or sometimes apically trilobate; lower leaves often 1.2–2.0 cm long and 1.7–5.0 mm wide, upper considerably shorter, narrow-linear. Capitula on short peduncles, sometimes subsessile, upright, ovate, 4–5 mm long and 1.5–2.7 mm wide, 2–5 at apices of branches, aggregated in fascicles, partly solitary, remote. Involucral bracts herbaceous, with scarious border; outer bracts small, almost roundish, inner considerably large, oval or lanceolate-elliptical, apically roundish. Receptacle convex, narrow-conical, glabrous. Peripheral florets pistillate, fewer, their corolla narrow-tubular, broadened toward base, 3-toothed, punctate-glandular, stellate-hairy, stigma lobes linear, acute, after anthesis scarcely exerted from corolla tube; central florets bisexual with tubular 5-toothed corolla, filaments quite long, anthers lanceolate-linear, with acute angular apical appendage, basal appendage short, subobtusate, stigma lobes short, linear, slightly thickened upward, divergent, short ciliate. Achenes ovoid, with flattened apex, weakly bordered. Flowering August. (Plate XX, Fig. 2).

On rocks of low desert hills.—*Soviet Central Asia*: Tien Shan (eastern part of Trans-Ili Alatau). *General distribution*: Dzhungaria-Kashgaria (Chinese part of Tien Shan). Described from Tien Shan. Type in Leningrad.

2. **K. komarovii** (Krasch.) Poljak. comb. nova.—*Tanacetum komarovii* Krasch. and Rubtz. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 168; Kryl. Fl. Zap. Sib. XI, 2759.

425 Cultivated low semishrubs, 25–45 cm high; tap root woody, 2 cm thick, with short, perennial, woody, ascending vegetative shoots above, covered with brownish-gray cracking bark. Fertile stems (or branches) numerous, upright, erect or more often weakly bent, woody below, stramineous, lustrous, light green above, angular-ribbed, sparsely stellate hairy. Leaves dark green, 1–3 cm long and 0.7–1.5 cm wide, 3- or 5-lobed, less often pinnately cut into lanceolate, short, acute, or subobtusate, 0.5–1.5 cm long and 1–4 mm wide lobes, sparsely stellate hairy on both sides, lowermost leaves sometimes undivided, oblanceolate, upper bracteal leaves, small. Capitula on short peduncles, ovoid, 3.5–4.0 mm long and 2–3 mm wide, aggregated at apices of branches and stems into short compact corymbs or fascicles. Involucres narrow cup-shaped, imbricate; involucral bracts herbaceous, scaly along margin, outer almost round, inner larger, oval. Peripheral florets pistillate, with narrow tubular corolla broadened toward base, 3-toothed; central florets bisexual, with tubular 5-toothed corolla. Achenes ovoid, with flattened apex. Flowering August.

Stony slopes of low desert hills.—*Soviet Central Asia*: Lake Balkhash Region (southern part of Altai in Zaisan District and northern banks of Lake Balkhash, Dzhungaria-Tarbagatai (Dzhungarian Alatau). *General distribution*: Dzhungaria-Kashgaria (western Mongolia and western China). Described from Kaldzhir River valley. Type in Leningrad.

GENUS 1550. *Artemisia* L.^{1,2}

L. Sp. pl. (1753) 845 and Gen. pl. ed. V (1754) 357.

Capitula numerous, small, aggregated in paniculate, racemose, less often spicate or subcapitate inflorescence, heterogamous, with pistillate, tubular, peripheral florets in one row and more numerous bisexual tubular central florets. Involucres hemispherical, ovoid, goblet-shaped or cup-shaped, up to 8(10) mm wide; involucre bracts herbaceous or coriaceous-herbaceous, imbricate, in 2–6 irregular rows, outer bracts gradually reducing and considerably shorter than inner bracts or all bracts almost equal, all or some with more or less distinct membranous border. Receptacle usually convex, conical, or hemispherical, less often almost flat, punctate-alveolar, glabrous or somewhat hairy. Corolla of pistillate florets very narrow, sometimes almost filiform tubular, 2-, less often 3-toothed, almost colorless, or corolla tubular, 2–3–4-toothed, colored; corolla of central florets usually campanulately or cup-like broadened in upper part, 5-toothed, yellow of various shades or reddish-violet; anthers lacking distinct basal appendage, linear, with lanceolate or oblong-lanceolate, acute, less often sub-obtuse apical appendage; pollen grains globose, with smooth or almost smooth surface, always nonspinulose. Style[stigma] bifid, lobes of stigma in peripheral pistillate florets usually narrow-linear, apically more or less narrowed, acute or subobtuse, lacking hairs or cilia, in bisexual central florets linear, apically truncate, barbate from upright hairs; style of rudimentary pistil of staminate florets apically not bifid, infundibuliform, with erect ciliate hairs or short connate lobes. Achenes small, homogeneous, obovate or oblong-ovate, almost terete or flattened, glabrous, weakly sulcate or with indistinct, longitudinal ribs of which only 2 almost winged, distinct, brownish, apically more or less roundish, lacking pappus but sometimes with slightly raised upper edge (as if rudiment of corona). Perennial, biennial and annual, geiconogamous [with fertilization between different flowers on the same plant] or autogamous [self fertilized] herbs or

¹Treatment by P.P. Poljakov.

²The name of the common wormwood, derived from the Greek name "Artemisa" or "Artemisia" ("Artemisa" was the wife of king Mausolus).

semi-shrubs with erect or ascending, sometimes procumbent stems and alternate leaves, with more or less divided, less often undivided or entire lamina.

A very large, undoubtedly heterogeneous genus comprising more than four hundred species distributed mainly in the temperate zone of Europe, Asia, and North America. One hundred and seventy-four species are found in the Soviet Union.

Type of genus: *Artemisia vulgaris* L.

KEY TO IDENTIFICATION OF SUBGENERA

1. Capitula homogamous, with few (to 8–10) bisexual florets; involucre ovoid, with 3–6 rows of imbricate, unequal bracts; receptacle very small, conical Subgen. 3. **Seriphidium** (Bess.) Rouy.
- + Capitula heterogamous, with pistillate peripheral florets and usually more numerous bisexual or staminate central disk florets; involucre of 2–3 rows, the bracts differing very little in size; receptacle quite prominent 2.
2. Disk florets staminate, but with abortive pistil. Subgen. 2. **Dracunculus** (Bess.) Rydb.
- + Disk florets bisexual Subgen. 1. **Artemisia** Less

Subgenus 1. Artemisia.—Less. Syn. Comp. (1832) 264.—Capitula heterogamous; peripheral florets pistillate, with narrow-tubular corolla having 2 teeth, disk florets bisexual, fertile, with 5(4) teeth. Receptacle glabrous or hairy.

427 Type of subgenus: type of genus.

1. Annuals or biennials 2.
- + Perennials or semishrubs..... 13.
2. Plants more or less densely white hairy, less often pubescence partly lost by end of vegetative growth; receptacle hairy, less often glabrous 3.
- + Plants green, glabrous or weakly hairy; receptacle glabrous 8.
3. Capitula subglobose or broadly campanulate, 2–4 mm wide 4.
- + Capitula hemispherical, usually 5–8(10) mm wide 5.
4. Plants up to 80–120 cm high, grayish from dense pubescence; terminal lobes of leaves oblong-linear, 3–8 cm long 77. **A. kulbadica** Boiss.
- + Plants shorter, glabrescent, green; terminal lobes of leaves shorter, narrowly linear 81. **A. anethifolia** Web.

5. Capitula numerous, in more or less lax paniculate inflorescence 6.
 + Capitula relatively fewer, in simple raceme or partly spicate inflorescence 7.
6. Stem 60–100 cm high, ribbed; lower cauline leaves large, to 12 cm long, their terminal lobes oblong-linear 75. *A. sieversiana* Willd.
 + Stem 25–40 cm high, round, sulcate; lower cauline leaves 2.0–4.5 cm long, their terminal lobes narrowly linear 80. *A. jacutica* Drob.
7. Lower cauline leaves 2–3 cm long, pinnately cut or thrice pinnately cut, their terminal lobes linear or linear-lanceolate, 1.0–1.5 mm wide 78. *A. samoiedorum* Pampan.
 + Lower cauline leaves mostly up to 1.5 cm long, twice pinnately cut, their terminal lobes narrower, up to 0.5 mm wide 76. *A. macrocephala* Jacq.
- 8(2). Stem 120–190 cm high, brownish-violet, almost simple terminating into long, narrow, dense paniculate inflorescence with short slender branches 52. *A. tournefortiana* Rchb.
 + Plants shorter, characters otherwise 9.
9. Capitula hemispherical, 4–6 mm in dia, with goblet shaped, woolly-hairy involucre 76. *A. succulenta* Ldb.
 + Capitula smaller, 2–3 mm in dia, subglobose, with cup-shaped, glabrous, smooth involucre 10.
10. Stems 3–10, slender, 8–12 cm high 81. *A. anethifolia* var. *korotkyi* (Krasch.) Poljak.
 + Stem solitary, taller 11.
11. Lower cauline leaves thrice pinnately cut, their terminal lobes oblong-lanceolate, entire or with 1–2 teeth 53. *A. annua* L.
 + Leaves once or twice pinnate 12.
12. Stem 10–50 cm high; lower cauline leaves 2–5 cm long, once or twice pinnately cut; terminal lobes of leaves filiform-linear 54. *A. palustris* L.
 + Stem 15–60(80) cm high; leaves 6–12 cm long, twice pinnately cut; terminal lobes of leaves narrowly linear-lanceolate 55. *A. aurata* Kom.
- 13.* Leaves, for the most part, green, subglabrous above, whitish beneath from short arachnoid tomentum; corolla of pistillate peripheral florets small, almost filiform tubular, with 2 teeth, almost colorless, much smaller than corolla of disk florets; style lobes of pistillate florets acute, those of disk florets obtuse 58.

*Whole of couplet 13 as per changed version given in the errata to Vol. XXVI published on p. 756 of Vol. XXVII.—General Editor.

- + Leaves usually concolorous; corolla of pistillate peripheral florets with 2–3 teeth, somewhat smaller than corolla of disk florets; style lobes of pistillate florets subobtuse or subacute, those of disk florets obtuse 14.
- ++ Leaves usually concolorous; corolla of pistillate peripheral florets with (2)3–5 teeth, scarcely smaller than or equal to corolla of disk florets, both colored; style lobes of all florets obtuse, truncate 78.
- 14. Capitula large, 5–8 mm long and 4–6 mm wide, in spicate inflorescence; achenes 3–4 mm long and 0.3–0.4 mm wide, linear-oblong, smooth, loosely enclosed in membranous sheath 21. **A. stelleriana** Bess.
- + Capitula smaller; achenes different, in tightly adhering sheath 15.
- 15. Capitula in dense fasciculate corymbs at apices of more or less inclined branches, usually forming corymbose-paniculate inflorescence; corolla with appressed hairs at apex 82. **A. incana** (L.) Druce.
- + Capitula differently borne; corolla glabrous at apex or with straight hairs 16.
- 16. Plants more or less densely covered with white appressed or erect hairs; receptacle hairy, less often glabrous; corolla of bisexual florets partly hairy in upper part 17.
- + Plants with green or glaucescent-green, usually sparsely hairy or almost glabrous leaves, or leaves green above and whitish-tomentose beneath; receptacle glabrous, less often hairy; corolla usually glabrous 30.
- 17. Stem sulcate, 60–100 cm high; lower cauline leaves 6–9 cm long and 3–7 cm wide, lamina broadly oval, almost thrice pinnately cut 74. **A. absinthium** L.
- + Stem not sulcate, less tall; leaves smaller 18.
- 18. Lower cauline leaves thrice pinnately cut; semishrub, glaucescent-grayish from dense crisped hairs (mountains of Soviet Central Asia) 67. **A. persica** Boiss.
- 429 + Leaves less complexly divided; plants whitish or gray, appressed hairy 19.
- 19. Lower cauline leaves ternately dissected or ternately toothed or even entire 20.
- + Lower cauline leaves, all or some, bipinnatifid or bi- or tripinnate, or bi- or tripinnatifid 22.
- 20. Semishrub, 30–60(70) cm high; capitula hemispherical 4–7 mm in dia, with goblet-shaped involucre; leaves more weakly hairy above than beneath 65. **A. lagocephala** (Boiss.) DC.
- + Perennials, 3–15 cm high; capitula subglobose, 2–4(5) mm in dia,

- with cup-shaped involucre; leaves whitish-hairy on both sides 21.
21. Capitula 2–3 mm in dia; receptacle glabrous; stems numerous or few, (3)10–15 cm high 60. *A. caespitosa* Ldb.
- + Capitula 4–5 mm in dia, receptacle hairy; stems 1–2, to 6–10 cm high 61. *A. cuspidata* Krasch.
22. All or most capitula on long (1–3 cm) peduncles 23.
- + Most capitula on shorter peduncles or sessile 24.
23. Capitula in simple racemose inflorescence; peduncles not leafy 57. *A. splendens* Willd.
- + Capitula in paniculate inflorescence; peduncles leafy 62. *A. schmidtiana* Maxim.
24. Capitula hemispherical, usually wider than long; involucre goblet-shaped; terminal lobes of leaves mostly oblong-oval, lanceolate-oblong, or lanceolate-linear 25.
- + Capitula subglobose or broadly ovate, less or as wide as long; involucre cup-shaped; terminal lobes of leaves narrowly linear or lanceolate-linear 27.
25. Semishrubs, with tap root; terminal lobes of leaves oblong-oval or linear-oblong, round or scarcely pointed 66. *A. rutifolia* Steph.
- + Perennials with creeping rhizomes; terminal lobes of leaves lanceolate-linear, acuminate 26.
26. Capitula in racemose-paniculate inflorescence; lower leaves 3–5 cm long; stem 40–70 cm high 63. *A. sericea* Web.
- + Capitula in simple racemose inflorescence; lower leaves 1.5–2.5 cm long; stem usually 15–35 cm high 64. *A. aschurbajevii* Winkl.
27. Receptacular hairs absent (receptacle glabrous) 59. *A. austriaca* Jacq.
- + Receptacular hairs always present (receptacle hairy) 28.
- 430 28. Terminal lobes of leaves narrowly linear or narrow lanceolate-linear, 5–10 mm long; plant of Caucasus 29.
- + Terminal lobes of leaves oblong-lanceolate or lanceolate-linear, smaller, 1.5–5.0 mm long; plants of Siberia and Kazakhstan 58. *A. frigida* Willd.
29. Capitula 4.0–6.5 mm in dia, in simple racemose inflorescence; leaf lobes narrowly lanceolate-linear usually 5–8 mm long 56. *A. caucasica* Willd.
- + Capitula up to 3 mm in dia, in racemose-paniculate inflorescence, often in simple racemose; leaf lobes narrowly linear, usually 5–10 mm long 56. *A. caucasica* var. *grossheimii* Krasch. ex Poljak.
- 30(16). Receptacle hairy 31.

- + Receptacle glabrous; hairs lacking or caducous 35.
- 31. Perennial herb, root in upper part having perennial, decumbent, vegetative shoots and ascending, simple, herbaceous, brownish-violet stems 32.
- + Semishrub; root thick, sometimes many-headed, bearing perennial, woody, ascending, short, vegetative shoots and straight brownish, branched or almost simple, stiff, virgate stems 33.
- 32. Stem 20–50 cm high; leaves up to 1.5–5.0 mm long, glabrous or weakly hairy only beneath; plants of plains and mountains 69. *A. rupestris* L.
- + Stem 10–25(35) cm high; leaves up to 1.5–2.0 cm long, glabrous or weakly hairy above, usually hairy beneath; plants of mountains 69. *A. rupestris* var. *viridis* (Willd.) DC.
- 33. Capitula small, mostly 2–3 mm in dia, in rather narrowly paniculate inflorescence; terminal lobes of leaves oblong-lanceolate or lobate 70. *A. obtusiloba* Ldb.
- + Capitula 3–5(6) mm in dia, in simple raceme or very narrow racemose-paniculate inflorescence; terminal lobes of leaves lanceolate or linear, short-acuminate 34.
- 34. Fertile stems 5–20 cm high; terminal lobe of leaves lanceolate, 1.5–3.0 mm long; plants hairy in beginning of vegetative growth, later subglabrous 73. *A. altaiensis* Krasch.
- + Fertile stems 25–35(45) cm high; terminal lobe of leaves linear, up to 3–6 mm long; plant generally densely appressed-hairy to end of vegetative growth 71. *A. subviscosa* Turcz.
- 431 35(30). Semishrubs or perennials with woody tap root, in upper part producing short, perennial, woody shoots and more or less numerous virgate, fertile stems 36.
- + Herbaceous, rhizomatous perennial, mostly with solitary stem (very rarely 2–3) 46.
- 36. Whole plant or leaves, involucre, and stems in part whitish, densely arachnoid-hairy 37.
- + Plants green, weakly hairy or glabrous, very rarely leaves more or less pubescent beneath 38.
- 37. Semishrubs, 35–60 cm high; rachis of lower and middle cauline leaves with lanceolate, acute, usually entire lobes between primary lobes; capitula globose 27. *A. gmelini* Web. var. *messerschmidtiana* (Bess.) Poljak.
- + Perennial, 15–35 cm high; rachis of leaves lacking lobes; capitula campanulate 68. *A. hololeuca* MB.
- 38. Rachis of leaf flattened, partly with lanceolate, acute, entire lobes between primary lobes; terminal lobes of leaves flat, narrowly lanceolate or oblong-linear, entire, sometimes toothed 39.

- + Rachis of leaf terete, narrowly linear, usually lacking lobes; terminal lobes of leaves filiform, filiform-linear or linear-lanceolate 41.
- 39. Leaves ternate; capitula comparatively large, 3.5–4.0(5.0) mm wide 28. *A. santolinifolia* Turcz.
- + Leaves twice pinnate; capitula smaller, 2.0–3.5 mm wide 40.
- 40. Semishrub, 50–100 cm high; leaves rather large, 3–7(15) cm long, their lobes and lobules remote, lobes subulate-toothed or entire 27. *A. gmelini* Web.
- + Semishrub, less tall, leaves smaller, with approximate acute lobes and lobules; lobules often entire 29. *A. freyniana* (Pamp.) Krasch.
- 41(38). Lower leaves ternate or almost ternate; their terminal lobes filiform or filiform-linear 42.
- + Lower leaves twice ternate; their terminal lobes linear-lanceolate, subobtusate 45.
- 42. Semishrub, 80–150 cm high; terminal lobes of leaves 6–15 mm long 22. *A. abrotanum* L.
- + Semishrubs or perennials, 15–70(80) cm high; terminal lobes of leaves short, 2–5(6) mm long 43.
- 43. Semishrub, 40–80 cm high; capitula quite numerous, hemispherical, small, 1.5–2.0 mm in dia 22. *A. abrotanum* L. var. *proceriformis* (Krasch.) Poljak.
- + Plant 15–40 cm high; capitula subglobose, large, 2–4 mm in dia 44.
- 44. Leaves short archnoid-hairy or subglabrous, their terminal lobes with very short, cartilaginous tips; capitula 2.5–4.0 mm in dia. (Caucasus) 23. *A. chamaemelifolia* Vill.
- 432 + Leaves archnoid-hairy and punctate-glandular; their terminal lobes lacking cartilaginous tips; capitula 2.0–2.5(3.5) mm in dia. (Baikal Region) 26. *A. adamsii* Bess.
- 45. Leaves green, punctate, rugose, appressed-hairy; capitula 4–5 mm in dia, with short peduncles, inclined or drooping 72. *A. martjanovii* Krasch. ex Poljak.
- + Leaves dark glaucescent green, glabrous; capitula 2.0–3.5 mm in dia, erect or inclined 70. *A. obtusiloba* var. *glabella* (Kar. and Kir.) Poljak.
- 46(35). Lower cauline leaves simple, twice or almost thrice pinnately cut, very rarely undivided, usually punctate-alveolate, concolorous, green, glabrous or relatively less densely hairy, very rarely when grayish beneath from dense pubescence, twice or almost thrice pinnately cut; involucre goblet-shaped or cup-shaped, wider than long or as long as wide; corolla of peripheral pistillate florets somewhat shorter and narrower than that of bisexual disk florets 47.

- + Leaves simple, entire, shallow-lobed, toothed or deeply pinnatifid or pinnately cut, lamina green, glabrous or weakly pubescent above, whitish- or grayish-tomentose beneath, very rarely weakly hairy; involucre cup-shaped or campanulate, mostly not as wide as long; corolla of peripheral pistillate florets more than a half as long as or a fifth to a third as narrow as corolla of bisexual disk florets 58.
- 47. Leaves weakly hairy above, whitish or grayish beneath from dense pubescence 48.
- + Leaves on both sides glabrous or not densely hairy 50.
- 48. Lower leaves twice pinnately cut, terminal lobes lanceolate, usually 1–2 mm wide; uppermost floral bracts simple, lanceolate; involucre weakly hairy 34. **A. armeniaca** Lam.
- + Lower leaves twice or thrice pinnately cut, their terminal lobes lanceolate-linear or oblanceolate, 0.5–1.5 mm wide, floral bracts often pinnately cut; involucre whitish-tomentose 49.
- 49. Lower leaves 4–9 cm long and 2–7 cm wide, floral bracts usually exceeding branches of inflorescence and projecting beyond; capitula large, 4–7 mm in dia 25. **A. macrantha** Ldb.
- + Lower leaves 2–5 cm long and 1–3 cm wide, floral bracts smaller, not exceeding inflorescence; capitula smaller, 2.5–4.0 mm in dia 24. **A. pontica** L.
- 50. Capitula in simple raceme; involucre bracts blackish- or dark brown along margin, scarious; florets numerous (45–156) 38. **A. laciniatifomis** Kom.
- + Capitula in racemose-paniculate inflorescence; involucre bracts whitish- or brownish-scarious along margin; florets fewer 51.
- 51. Capitula less numerous, partly in racemose and partly in racemose-paniculate inflorescence 52.
- + Capitula rather numerous, in paniculate inflorescence 52.
- 52. Leaves sessile, usually simple, oblong-lanceolate 39. **A. macrorhiza** Turcz.
- + Lower leaves petiolate, twice or almost thrice pinnately cut 53.
- 53. Lower cauline leaves usually hairy beneath, 2–6 cm long, oblong-oval, twice or almost thrice pinnately cut, with approximate lobes and lobules 37. **A. phaeolepis** Krasch.
- + Lower cauline leaves glabrous, 10–18 cm long, oval, bipinnatisect, with remote lobes and lobules 33. **A. remotiloba** Krasch. ex Poljak.
- 54. Leaves pinnatifid, i.e., their lobes deeply divided, but not up to midrib, with toothed, acute, usually entire lobules 55.

- + Leaves twice or almost thrice pinnatifid 56.
- 55. Stem 90–125 cm high and to 4–5 mm thick; basal leaves long-petiolate, 25–35 cm long including petiole and 10–15 cm wide 32. **A. maximovicziana** Krasch. ex Poljak.
- + Stem 15–90 cm high; leaves smaller, usually 4–12(15) cm long and 2–7 cm wide 35. **A. latifolia** Ldb.
- 56. Terminal lobe of leaves narrow, 0.5 or about 1 mm wide; capitula small, usually 2–3 mm in dia 36. **A. laciniata** Willd.
- + Terminal lobe of leaves wide, usually 1.5–2.0 mm wide; capitula 4–6 mm in dia 57.
- 57. Rhizome producing few, straight, long, vegetative leafy shoots and usually one fertile stem 70–120 cm high, leaves twice pinnately cut, their terminal lobes linear-lanceolate, often 4–10 mm long, entire, scarcely acuminate; achenes almost winged, scaly-ribbed 30. **A. medioxima** Krasch. ex Poljak.
- + Rhizome bearing rosette of basal leaves and single, 45–90(110) cm-high stem; leaves twice or almost thrice pinnately cut, their terminal lobes shorter, acute, often with short toothed; achenes ribbed 31. **A. tanacetifolia** L.
- 58(46). All leaves or some simple, entire, toothed or shallow-lobed 59.
- + Lower and middle cauline leaves once or twice pinnately cut or deeply pinnatifid 63.
- 59. All leaves narrow-linear, 2–5 mm wide, entire 14. **A. subulata** Nakai.
- 434 + Lower and middle cauline leaves much wider, usually toothed or shallowly lobed 60.
- 60. Middle and lower cauline leaves linear-lanceolate or lanceolate, acute 61.
- + Leaves obovate, oblong-cuneate or oval 62.
- 61. Middle cauline leaves 1–2 cm wide, more or less deeply divided-toothed, usually lacking auricles at base 13. **A. integrifolia** L.
- + Middle cauline leaves usually 2.0–2.5 cm wide, small-toothed or with short, somewhat obtuse teeth, in part entire with auricles at base 12. **A. komarovii** Poljak.
- 62. Stem 60–100(140) cm high; middle cauline leaves 6–10 cm long and 3–5 cm wide, narrowly ovate, sharp-toothed; capitula narrowly campanulate 9. **A. stolonifera** Maxim.
- + Stem 20–25(65) cm high; middle cauline leaves 4–6(8) cm long and 2–4 cm wide, oval or oval-cuneate, short and wide lobed-toothed; capitula broadly campanulate or subglabrous 11. **A. saitoana** Kitamura

- 63(46). Lobes of middle cauline leaves usually narrowly linear and entire or with small sharp teeth 64.
 + Lobes of leaves wider, usually pinnately cut or deeply lobed-toothed, less often with small teeth or entire 67.
64. All or some lobes of leaves small and sharp-toothed 20. **A. selengensis** Turcz.
 + Lobes of leaves lacking teeth, usually entire 65.
65. Capitula campanulate, 3.5–4.0 mm long and 2.0–2.5 mm in dia; leaves not densely appressed hairy above, lobes 4–6 mm wide 19. **A. umbrosa** Turcz. ex DC.
 + Capitula narrowly campanulate or almost narrowly cylindrical, 2.5–3.0 mm long; leaves glabrous above, lobes 2–4(5) mm wide 66.
66. Middle cauline leaves usually 5–8 cm long, their lobes 2–3(4.5) cm long, narrowly linear, short-acuminate; capitula up to 10–1.2 mm in dia, few-flowered (10–14 florets) 18. **A. lavandulifolia** DC.
 + Middle cauline leaves often 8–12 cm long, their lobes somewhat longer (4–6 cm long), attenuate-acuminate; capitula 1.2–2.0 mm in dia, many-flowered, (20–26 florets) 15. **A. rubripes** Nakai
67. Capitula subglobose or campanulate-globose, usually 4–5(6) mm long and almost as much in dia 68.
 + Capitula campanulate or ovoid, smaller, 2.0–3.5(4.0) mm long 71.
- 435 68. Lower and middle cauline leaves 3–7 cm long and 2–5 cm wide, deeply pinnatifid into lanceolate, entire or lobes with very few teeth 69.
 + Leaves large, 8–13 cm long and 7–19 cm wide, pinnately cut, twice pinnate-pinnatifid; primary lobes incised, with sharp teeth; teeth simple, entire or with short, acute, small teeth 70.
69. Lobes of leaves linear-lanceolate, acute, entire or with few, acute, linear teeth or even (mainly in lower leaves) in turn divided into 2–3 lobes; lamina green above, subglabrous or moderately arachnoid-hairy 4. **A. tilesii** Ldb.
 + Lobes of leaves lanceolate, entire or with few small teeth, lamina greenish-gray above, rather densely arachnoid-hairy 10. **A. koidzumi** Nakai
70. Middle cauline leaves woolly, (8)10–13 cm long and 7–10 cm wide, pinnately cut, their lobes linear-lanceolate, with fewer acute teeth, lobes of upper cauline leaves simple 2. **A. opulenta** Pamp.
 + All or almost all leaves 6–9.5 cm long and as wide, twice pinnate

- to pinnatifid, lobes lanceolate, deeply pinnatifid; lobes of upper cauline leaves narrowly lanceolate, with sharp teeth 3. *A. unalaskensis* Rydb.
71. Capitula small, 2.0–2.5 mm long, always remote on long, very slender, glabrous branches 7. *A. silvatica* Maxim.
- + Capitula 2.5–4.0 mm long, always aggregated densely on short branches 72.
72. Middle and some upper leaves divided in narrowly linear or linear lobes; capitula 3–4 mm long 73.
- + Leaves deeply divided into lanceolate lobes; capitula 2.5–3.0 mm long 75.
73. Leaf lobes with small and sharp teeth, lower-most pair of lobes always with short stalk; lamina bright green and glabrous above 8. *A. ussuriensis* Poljak.
- + Leaf lobes sessile, entire or with remote short teeth; lamina dull green above and appressed-hairy or glabrous above 74.
74. Leaves glabrous or weakly hairy above; lower leaves 12–17(20) cm long and 6–10(12) cm wide, deeply pinnatifid, their lobes entire, sometimes with short teeth 17. *A. montana* Pamp.
- 436 + Leaves punctate-glandular and more or less densely appressed-hairy above; lower leaves 6–8(9) cm long and 5–7 cm wide, pinnately cut, their lobes with short somewhat sharp teeth, sometimes almost entire 16. *A. argui* Lev. and Van.
75. Stem 20–65 cm high, simple, branched only above with short adpressed branches; lower cauline leaves 5–8 cm long 76.
- + Stem 65–160 cm high, branched in upper third, branches more or less long, upward spreading or inclined 77.
76. Leaves green above, glabrous or weakly pubescent; lobes of middle and some upper leaves narrowly linear, mostly 1.5–2.0 mm wide, acute 6. *A. mongolica* Fisch. ex Nakai
- + Leaves dull green or grayish-green above, arachnoid hairy; lobes of middle and some upper leaves wider, short-pointed apex 5. *A. leucophylla* Turcz.
77. Whole plant dull green or grayish, arachnoid-hairy; branches long, lower 30–40 cm long; leaves on branches with paired small lanceolate auricles at base, lower leaves with 1–2 pairs of lobe-like, somewhat obtuse teeth, others mostly narrowly linear or linear-lanceolate, entire; capitula to 3 mm long 1. *A. vulgaris* L. var. *jaxartica* Poljak.
- + Plant green, branches usually shorter, upward-spreading; leaves on branches pinnate or linear, usually lacking auricle; capitula 3–4 mm long 1. *A. vulgaris* L.

- 78(13). Capitula small, 2.5–3.0 mm in dia, subglobose, in narrowly racemose-paniculate inflorescence; stigma lobes apically truncate, with narrowly linear-cuneate appendage 51. **A. keiskeana** Miquel.
- + Capitula usually 3.5–8(10–12) mm in dia, in simple raceme, corymb, or capitate-corymbose inflorescence; stigma lobes obtuse, truncate, lacking appendage 79.
79. Capitula in simple racemose or spicate-racemose inflorescence, only some of them apically loosely clustered 84.
- + Capitula in more or less dense capitate or oblong-ovoid head, very rarely in simple raceme 80.
80. Florets and achenes quite densely covered with long, straight, erect, white hairs 48. **A. leontopodioides** Fisch. ex Bess.
- + Florets glabrous or weakly hairy 81.
81. All florets with wide, cup-shaped-conical, dark-purple and punctate glandular corolla, with 5 rather large deltoid recurved teeth 43. **A. globularia** Bess.
- 437 + Florets yellow, characters otherwise 82.
82. Capitula fewer, in capitate-corymbose inflorescence; stem usually 10–15(25) cm high; lower leaves 1.5–2.0 cm long 44. **A. glomerata** Ldb.
- + Capitula numerous, in dense oblong-ovoid or globose inflorescence; leaves smaller 83.
83. Plant with short, erect, perennial, sterile, woody branches densely covered with small, overlapping leaves making them appear like hemispherical or oblong “heads;” leaves 4–7 mm long, ternately divided 47. **A. senjavinensis** Bess.
- + Perennial, branches prostrate, not resembling “heads;” lower cauline leaves 1.0–1.8 cm long, twice ternately dissected or twice ternate-palmate or pinnately cut 50. **A. triniana** Bess.
- 84(79). Plants whitish from dense silky hairs; leaves twice ternately dissected to pinnatipartite 85.
- + Plants glabrous or green, comparatively less densely hairy; leaves twice pinnately cut or simply ternate 86.
85. Lower cauline leaves 2–5 cm long, twice ternately dissected terminal lobes 5–15 mm long; capitula large, 5–8 mm wide 46. **A. insulana** Krasch.
- + Leaves smaller, 0.7–1.2 cm long, twice pinnately dissected, terminal lobes 1.5–3.0 mm long; capitula smaller 49. **A. lagopus** Fisch. ex Bess.
86. Leaves simple, ternate-palmate; capitula subglobose, 4–6 mm wide 45. **A. furcata** MB.

- + Leaves twice pinnately dissected; capitula hemispherical, 5–10(12) mm wide 87.
- 87. Corolla in all florets glabrous, punctate-alveolate leaves on both sides punctate-alveolate 41. **A. punctigera** Krasch. ex Poljak.
- + Corolla hairy, if glabrous then capitula large, 10–12 mm wide 88.
- 88. Capitula 10–12 mm in dia, flowers numerous, to 150; primary lobes of lower cauline leaves usually 2–3 pairs 42. **A. norvegica** Fries.
- + Capitula 5–8 mm in dia; flowers fewer (50–70); primary lobes of lower cauline leaves usually 5–7 pairs 40. **A. arctica** Less.

Section 1. Artemisia.—*Artemisia* sect. *Abrotanum* subsect. *Polycarpicae* DC. Prodr. VI (1837) 105.—Herbaceous perennials with short rhizomes; leaves simple, entire or serrate, with lobe-like teeth or even pinnately lobed, green and glabrous or weakly hairy above, 438 whitish- and grayish tomentose beneath, less often glabrous on both sides. Receptacle glabrous; florets glabrous.

Series 1. Vulgares Rydb. in North. Amer. Fl. 34, 3 (1916) 265.—Lower cauline leaves pinnately cut or deeply pinnatifid into linear-lanceolate, lanceolate, oblong or broadly-rhombic, more or less toothed lobes; capitula mostly 3–4(5) mm long, in more or less dense, narrow, paniculate inflorescence.

1. **A. vulgaris** L. Sp. pl. (1753) 848; Ldb. Fl. Alt. IV, 52; DC. Prodr. VI, 112; Ldb. Fl. Ross. II, 585 p. p.; Maxim. Prim. Fl. Amur. 160; Boiss. Fl. or. III, 371; Kryl. Fl. Alt. III, 650; Kom. Fl. Manchzh. III, 671; Fedtsch. Perech. Rast. Turk. IV, 199; Hegi, Ill. Fl. VI, 2, 637; Grossh. Fl. Kavk. IV, 141; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2812.—*A. samamisica* Bess. Tent. de Abrotan. (1834) 50, pl. Gmel. Jun.—*A. superba* Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI (1930) 473.—**Exs.:** GRF No. 1618.

Perennial. Rhizome strong, in upper part thickened; stem herbaceous, erect, (45)65–160 cm high, angular-ribbed, more or less branched, usually brownish-violet, leafy, weakly hairy. Leaves green above, glabrous or not densely arachnoid hairy, grayish, arachnoid-hairy beneath, lower-most leaves petiolate, rest sessile, 3–15 cm long and 1.5–11 cm wide, deeply pinnately dissected or pinnately cut into elliptical-lanceolate or linear-lanceolate, usually deeply incised or toothed, lobes 1–10 cm long and 2.5 cm wide; upper leaves small, floral bracts entire, linear. Capitula oblong or narrowly campanulate, 3–4 mm long and 1.5–3.0 mm in dia, slightly inclined, less often

almost drooping, in dense racemes on secondary branches forming in general, more or less narrow or rather wide panicle. Involucre arachnoid-hairy, involucre bracts scarious along margin, outer bracts ovate, acuminate, inner bracts longer, elliptical, obtuse. Receptacle convex. Peripheral pistillate florets 7–10; their corollas narrowly tubular, stigma lobes narrowly linear, straight, erect; disk florets bisexual, (5)8–20, their corollas narrow, cup-shaped-conical, smooth, reddish-brownish; anthers linear, on rather long filaments, apical appendages of anthers acute, basal appendages subacute; stigma lobes at maturity slightly exserted from tube, arcuate, thickened upward, truncate, with long dense cilia.

Forest, partly forest-steppe and steppe zones, in coniferous-deciduous open deciduous forests, around forest glades, edges of forests, river valleys, ravines, gullies, mountain slopes, meadows, scrubs, fallow lands, near fields and dwellings.—*European part*: Karelia-Lapland, Dvina-Pechora, Ladoga-Ilmen, Baltic Region, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, 439 Lower Volga; *Caucasus*: Ciscaucasia, Dagestan, Eastern and Western Transcaucasia; *Western Siberia*: Ob River Area, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria, Zeya-Bureya; *Soviet Central Asia*: Lake Balkhash Region, Dzhungaria, Tarbagatai, Tien Shan, Syr-Darya, Pamiro-Alai Region. *General distribution*: Scandinavia, Central and Atlantic Europe, Mediterranean Region, Balkans-Asia Minor, Mongolia, Dzhungaria-Kashgaria, North America. Described from Western Europe. Type in London.

Economic Importance. The plant contains essential oil; the recovery of the oil from the dry mass from the Saratov Region is 0.3–0.61% (Kazakevich, 1923). The recovery from Central Asian plants is lower—not more than 0.03–0.09% (Kudryashev, 1936; Voroshilov, 1941). The oil content of the roots reaches 0.1%. The oil is light yellow with the mild characteristic aroma of the plant. According to S.M. Strepkov (1937), the recovery of the oil in plants from Uzbekistan is 0.061–0.077%, on absolutely dry matter—0.156–0.17%; D.—0.9634; acid number 7.79; ester number 144.94.

The European oil has the following constants: $D^{20} = 0.907\text{--}0.927$; L . from 8 to 19; $n^{D20} = 1.4776\text{--}1.485$; acid number 1.2; ester number 16–103; ester number of acetylation 50–206. Solubility in 90% alcohol—1:1. The oil contains: cineole, α -thujone, paraffin and borneol (cited from Goryaev). Traces of alkaloids have been found in the leaves and stems (Bankovskii, Zarubina and Sergeeva, 1947). A plant collected in the flowering stage from the floodplains of the Yenisei River (Vershinin) contained: 21.3% protein, 24.5% cellulose, 1.9% oil, and 43.2% nitrogen-free extractable substances. Reports about the edibility of this species for animals are contradictory (Larin, 1956).

2. *A. opulenta* Pamp. in Nuov. Giorn. Bot. Ital. n. s. XXXVI (1930) 464.—*A. vulgaris* var. *kamtschatica* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 54; DC. Prodr. VI, 113; Kom. Fl. Kamch. III, 156.—*A. vulgaris* var. *communis* Ldb. Fl. Ross. II (1844–1846) 586 p. p.—*A. verlorum* auct. non Lamotte: Hult. Fl. Kamtch. IV (1930) 189.—*A. koidzumii* Nakai in Bot. Mag. Tokyo, XXV (1911) 56 p. p.; Sugawara, Pl. of Saghal. (1937) 303 and Illustr. Fl. Saghal. IV (1940) 1823.— *Ic.*: Sugawara, *ibid.* tab. 835.

Perennial. Rhizome creeping, woody; stem erect, 80–125 cm high, angular-sulcate, sparsely hairy or subglabrous, leafy, simple or with short adpressed branches in upper part. Leaves green and glabrous above, sometimes weakly pubescent, whitish arachnoid-tomentose beneath, lower leaves withering early: middle cauline leaves short-petiolate with short, linear-lanceolate auricles at base, (8)10–13 cm long and 7–10 cm wide, pinnately cut, their lobes linear-lanceolate, acute, most often 4–6 cm long, with few, narrow, sharp teeth; upper cauline leaves mostly with entire lobes, sometimes with occasional short teeth; floral bracts undivided, lanceolate or linear-lanceolate, upper-most small, not exceeding inflorescence. Capitula on short branches, usually densely clustered, sessile, broadly campanulate, 4–5 mm long, in narrow, dense, racemose-paniculate inflorescence, less often branches elongated. Involucre weakly hairy; involucre bracts lanceolate, subacute, with wide scarious border; inner bracts somewhat larger than outer. Receptacle convex. Peripheral florets 7–8, pistillate, fertile; their corollas filiform-tubular; central disk florets bisexual, fertile, 14, their corollas narrow, cup-shaped-conical, with recurved teeth, glabrous; anthers exserted from tube, apical appendages of anthers cuneate, basal appendages round; stigma lobes arcuate, short-ciliate. Flowering August.

Slopes of ridges in birch forests, alder forests, meadows, coastal areas, often near dwellings as a weed.—*Far East*: Kamchatka, Sakhalin. *General distribution*: Northern Japan. Described from Kamchatka. Type in Florence?

Note. Judging from the diagnosis, *A. verlorum* Lamotte, according to Hultén (1930), is not identical to the plant from Kamchatka. But from the data presented by Pampanini (1930), Lamotte's species is found in China and partly in Japan. As regards Kamchatka, *A. opulenta* Pampan., corresponding to *A. verlorum* Hult., is found within its boundaries.

3. *A. unalaskensis* Rydb. in North. Am. Fl. 34, part 3 (1916) 266; Hultén, Fl. Aleut. 326 and Fl. Al. X, 1577.—*A. wrightii* Gray, Proc. Am. Acad. 19 (1883) 48.—*A. vulgaris wrightii* (Gray) Hall and Clements, The North Am. Sp. of Artemisia (1923) 80–87.—*A. ursorum*



1 — *Artemisia stelleriana* Bess. Habit, peripheral pistillate floret, style, bisexual disk florets, stamen, achene. 2 — *Kaschgaria brachanthemoides* (Winkl.) Poljak. Upper part of plant, peripheral pistillate floret, bisexual disk floret, stamen, style, schematic diagram of involucre with general receptacle, achene.

Hult. Fl. Kamtch. IV (1930) 180.—*A. opulenta* Pampan. f. *laciniata* Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI (1930) 465.

Perennial. Stem up to 1 m high, erect, to 5 mm in dia in middle, ribbed, glabrous or weakly arachnoid-hairy, simple, leafy. Leaves green and weakly hairy above, whitish arachnoid-tomentose beneath; all leaves except uppermost petiolate, middle and some upper leaves 6–8 cm long, oval or almost round, deeply pinnately divided, their lobes oblong or lanceolate, more or less deeply incised, lobules narrowly lanceolate, acute, toothed-incised; upper cauline leaves subsessile, divided usually into narrowly lanceolate, entire lobes or with few short teeth; uppermost lobes sessile, entire, linear-lanceolate. Capitula broadly campanulate or subglobose, to 5 mm long, clustered on very short branches, in short, narrow and dense paniculate inflorescence. Involucre arachnoid-hairy; involucre bracts scarious along margin, outer bracts oval, subacute, inner oblong. Peripheral pistillate florets 5–8; disk florets bisexual, 20–25. Achenes small, brown, to 1 mm long. Flowering August.

443 Meadows, seacoasts.—*Far East*: Commander Islands, Kamchatka. *General distribution*: North America (Aleutian Islands, Alaska). Described from Unalaska Island. Type in New York.

4. *A. tilesii* Ldb. in Mém. Acad. Sc. Pétersb. V (1813) 568; Bess. in Mém. Soc. Nat. Mosc. VIII, 70; DC. Prodr. VI, 113; Rydb. in North Am. Fl. 34, part 3, 267, excl. syn. *A. tilesii arctica* and *A. tilesii unalaskensis*; Kom. Fl. Kamch. III, 155; Hult. Fl. Kamtch. IV, 186; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, X, 84 and in Kryl. Fl. Zap. Sib. XI, 2815.—*A. vulgaris* var. *tilesii* Ldb. Fl. Ross. II, 2 (1844–1846) 586.—*A. vulgaris* ssp. *tilesii* Hall. and Clem. in The North Amer. Spec. of Artem. (1923) 72.—**Exs.**: GRF No. 3166.

Perennial. Stem few or solitary, arising from more or less thick rhizome, erect or ascending only at base, simple, (12)15–35(45) cm high, more or less densely hairy, mostly above, with fine long entangled appressed hairs, sometimes completely glabrous below. Leaves subglabrous and green or even weakly arachnoid-hairy above, grayish, whitish-tomentose beneath; lower and middle cauline leaves 3–7 cm long and 2–5 cm wide, pinnately cut into lanceolate or linear-lanceolate, acuminate lobes, their lobes entire or with very few (1–3) teeth, or divided (mainly lower) into 2–3 lobules; uppermost leaves simple, entire, linear. Capitula broadly campanulate or subglobose, 4–6 mm in dia on long or short peduncles, in dense or lax racemose-paniculate inflorescence 3–12 cm long. Involucre bracts dark violet-brown along margin with wide scarious border; outer bracts oval, arachnoid-hairy, inner narrower, elliptical or lanceolate. Receptacle convex,

hemispherical, glabrous. Peripheral florets 9, pistillate, corolla narrowly tubular, with 2 teeth, stigma lobes exerted from tube after anthesis, linear, straight; central disk florets numerous (to 60), bisexual, their corollas cup-shaped-conical, colored, anthers lanceolate, apical and basal appendages of anthers acute, stigma lobes not exerted from tube, short, linear, erect, short-ciliate. Achenes (immature) oblong-linear, angular; pappus absent. Flowering August.

Circumpolar zone on coastal, mostly sandy slopes, less often in dry tundra.—*European part*: Arctic Europe, Novaya Zemlya, Arctic Siberia, Chukotka, Anadyr, Kamchatka. *General distribution*: North America. Described from Kamchatka. Type in Leningrad.

5. **A. leucophylla** Turcz. ex C.B. Clarke Comp. Ind. (1876) 162; Kom. Fl. Manchzh. III, 674; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2814.—*A. leucophylla* var. *typica* f. *genuina* Pamp. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4 (1930) 414.—*A. vulgaris* var. *leucophylla* 444 Turcz. ex Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 54.—*A. vulgaris* α. *minor* Ldb. Fl. Alt. IV (1833) 82, excl. syn. Tilesii.—*A. vulgaris* ε. *leucophylla* Turcz. ex Ldb. Fl. Ross. II, 2 (1844–1846) 585.

Perennial. Rhizome creeping in many-stemmed specimens, nodulose, with numerous fibrous roots; stem 35–65 cm high, solitary or few, ribbed, sometimes violet, arachnoid-hairy, with short branches above. Leaves dull green or greenish-gray and arachnoid-hairy above, whitish-tomentose beneath, indistinctly punctate-glandular; lowermost leaves petiolate, 5–8 cm long and 4–7 cm wide, pinnately cut, with broadly rhombic, coarse-toothed, 1–2 pairs of lobes 0.5–1.0 cm wide; middle and upper cauline leaves sessile, smaller, less deeply dissected and with narrower lobes; lower floral bracts also pinnatisect, with lanceolate or linear lobes, uppermost undivided, linear. Capitula broadly campanulate, 3–4 mm long and 2–4 mm in dia, aggregated or solitary on branches, usually forming narrow panicle. Involucre arachnoid-hairy, greenish or violet; involucre bracts with wide scarious border; outer bracts oval, inner considerably larger, obovate, subobtus. Peripheral florets pistillate with filiform-tubular corolla; disk florets bisexual, with conical corolla. Flowering July to August.

Steppe slopes, river valleys, in alkaline meadows.—*Western Siberia*: Altai (Chui steppe). *General distribution*: Mongolia, Tibet. Described from northern Mongolia (Lake Khubsugul). Type in Leningrad.

6. **A. mongolica** Fisch. ex Nakai in Bot. Mag. Tokyo, XXXI (1917) 112 and Fl. Sylv. Kor. XIV (1923) 101; Pampan. in Nuov. Giorn. Bot.

Ital. n. s. XXXVI, 409; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1041; Krasch. in Spisok. Rast. Gerb. Fl. SSSR, X, 83.—*A. vulgaris mongolica* Fisch. and *γ. coarctata* Forsell ex Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 53; DC. Prodr. VI, 113.—*A. vulgaris* var. *tenuifolia* Turcz. ex DC. Prodr. VI (1837) 1113; Ldb. Fl. Ross. II, 585.—*A. mongolica* var. *tenuifolia* f. *genuina* Pampan. op. cit. 409.—**Exs.:** GRF No. 3164a, b, c.

Perennial. Rhizome woody; stem erect, (20)40–75 cm high, angular-sulcate, more or less pubescent or glabrous, simple, with short branches only in upper part. Leaves green, usually glabrous above, whitish-arachnoid-pubescent beneath; lower cauline leaves withering early, long-petiolate; middle leaves 3–9 cm long, deeply pinnately divided, lobes oblong-lanceolate or lanceolate, more or less deeply divided into teeth, teeth acute, upper sessile, stipulate, pinnate, lobes mostly simple, linear-lanceolate, acute, less often with short teeth; uppermost floral bracts small, simple, linear-lanceolate. Capitula campanulate, about 3 mm long and 1.5 mm in dia, clustered on short branches in narrow elongated panicle. Involucre arachnoid-hairy-tomentose. Peripheral florets pistillate, their corollas narrowly tubular; disk florets bisexual
445 with conical corolla. Flowering August.

Steppes, alkaline meadows, river valleys, southern steppe slopes of [mud] volcanic cones.—*Eastern Siberia:* Angara-Sayans, Dauria. *General distribution:* Mongolia. Described from Mongolia and Dauria. Type in Leningrad.

Series 2. Silvaticae Poljak.—Leaves thin; lower cauline leaves large, deeply pinnately divided into lanceolate, lobes with small sharp teeth. Capitula small, 2.0–2.5 mm long, on very long, slender, strongly inclined branches.

7. *A. silvatica* Maxim. Prim. Fl. Amur. (1859) 161; Kom. Fl. Manchzh. III, 670; Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4, 443; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1043.

Perennial. Rhizome short, thickened in upper part; stem erect, 80–130 cm high, angular, sulcate, weakly hairy almost simple, leafy, in upper part with relatively short branches. Leaves green above, glabrous or weakly pubescent, whitish- and grayish-arachnoid-hairy-tomentose beneath, lower leaves withering early; middle cauline leaves petiolate, 10–15(19) cm long and 7–11 cm wide, deeply pinnately divided or lobes lanceolate, small-toothed, upper smaller, with 3–5 narrowly lanceolate, acute, mostly entire lobes; uppermost floral bracts small, linear-lanceolate. Capitula pedunculate, broadly campanulate, 2.0–2.5

mm long and 1.5–2.0 mm in dia, distant, inclined, in lax, pyramidal, racemose-paniculate inflorescence. Involucral bracts not densely arachnoid-hairy, smooth, with more or less wide, scarious border; outer bracts oval, inner ones wide, oblanceolate, larger. Peripheral florets pistillate, 7, filiform, tubular, very small, with 2 teeth, stigma lobes strongly exserted from tube, filiform-linear, long, erect, somewhat inclined; disk florets 10, bisexual, their corollas conical, punctate-glandular, with convergent or divergent teeth, anthers on short filaments, linear; apical appendages of anthers acute angled, basal appendages not distinct; stigma lobes short, arcuate, after anthesis. Achenes to 1 mm long, flattened, narrowly ovoid, dark brown. Flowering August. (Plate XXI, Fig. 1).

Forest zone, in deciduous, coniferous-deciduous forests, in river valleys in bottom-land deciduous forest, sometimes along river banks.—*Far East*: Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Northern China. Described from mouth of Ussuri River. Type in Leningrad.

Series 3. Nutantiflorae Poljak.—Leaves glandular-hairy above along veins, lower and middle cauline leaves pinnately parted into elliptical or broadly lanceolate, small-toothed, divided, petiolate lobes; capitula on short branches, drooping.

446 8. *A. ussuriensis* Poljak. nom. nov.—*A. nutantiflora* Kom. in Izv. Bot. Sada Akad. Nauk SSSR, XXX, 1–2 (1932) 219 non Nakai.

Perennial. Rhizome short, woody; stems straight, up to 50 cm high, ribbed, quadrangular in upper part, not densely hairy, with short, inconspicuous hairs, leafy, simple, with short branches. Leaves green above, glandular-hairy on veins, yellowish-white and tomentose beneath; lower, middle and partly upper, cauline leaves 6–10 cm long and 4.0–7.5 cm wide, with flattened petioles, basally with pinnately parted auricles; leaves short petiole, broadly lanceolate or elliptical, acute-toothed; upper floral bracts small, sessile, not exceeding inflorescence, simple, linear-lanceolate or lanceolate. Capitula sessile, strongly approximate, narrowly campanulate, 2.5–3.5 mm long, with dense racemes on branches, forming relatively narrow racemose-paniculate inflorescence. Involucral bracts arachnoid-hairy, with wide scarious margin; outer bracts broadly elliptical or oval, inner large, lanceolate. Peripheral florets pistillate, 8, with narrowly obconical corolla; disk florets bisexual, fertile, 10; corolla narrowly conical with narrow and long, deltoid, divergent teeth, weakly punctate-glandular; stigma lobes not exserted from tube, initially approximate, later strongly recurved, apically thickened, short ciliate. Flowering August.

Inundated meadows in forest zone.—*Far East*: Ussuri. Endemic. Described from Far East. Type in Leningrad.

Series 4. Simplicifoliae Poljak.—Leaves lanceolate or ovate, entire or with short teeth, or even toothed-lobate, usually with auricles.

9. *A. stolonifera* (Maxim.) Kom. Fl. Manchzh. III (1907) 676; Nakai, Fl. Korean. II, 29; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1043; Hara, Enum. Spermatoph. Japon. II, 126 p. p.—*A. vulgaris* var. *stolonifera* Maxim. Prim. Fl. Amur. (1859) 161; Franch. and Sav. Enum. I, 239.—*A. vulgaris* var. *stolonifera* *lusus incana* Regel Tent. Fl. Ussur. (1862) 95.—*A. integrifolia* var. *stolonifera* (Maxim.) Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI (1930) 481.—*A. stolonifera* var. *laciniata* Nakai in Bot. Mag. Tokyo, XXXIV (1920) 53.—*lc.*: Kom. and Alis. Opred. Rast. II, Plate 310.

Perennial. Rhizome creeping, with stolons; vegetative aerial shoots erect, 30–50 cm high, leafy. Stem 60–100(140) cm high, glabrous or with appressed hairs, with short adpressed branches in upper part. Leaves sessile or subsessile, often with short auricles at base, dark green and glabrous or arachnoid-hairy above, whitish-arachnoid-tomentose beneath; lower cauline leaves and ones on non-flowering shoots caducous, middle cauline leaves often 6–9(10) cm long and 3–4(5) cm wide, broadly lanceolate or obovate, cuspidate, with cuneate base and small subacute teeth; upper cauline leaves smaller, lanceolate, entire or with short acute teeth; uppermost leaves simple, narrowly lanceolate or almost linear. Capitula on narrowly winged peduncles, 4–5 mm long, approximate, in narrow, dense, racemose-paniculate inflorescence. Involucres arachnoid-hairy; outer involucral bracts ovate; inner bracts larger, obovate, glabrous, with wide scarious margin. Receptacle convex. All florets fertile; peripheral pistillate florets 11 or 12, their corollas narrowly tubular; stigma lobes conspicuous, narrowly linear, straight or weakly inclined; disk florets bisexual, 12–14, their corollas narrowly conical, glabrous, with recurved teeth; anthers linear, apical appendages acute, subulate, exserted from corolla, basal appendages acute; style somewhat shorter than stamen, filiform-linear, stigma lobes after flowering exserted from corolla, arcuate, thickened, with divergent cilia. Achenes 1.5 mm long, narrowly ovate, somewhat flat, sulcate, dark brown. Flowering July to August. (Plate XXII, Fig. 1).

Forest zone on ridges, along slopes, slopes of [mud] volcanic cones in deciduous forests (often in oak groves), in scrubs, sometimes in river valleys, meadows, old fields.—*Far East*: Zeya-Bureya (south), Uda River Area, Ussuri, Sakhalin. *General distribution*: Japan, China. Described from Far East. Type in Leningrad.

10. **A. koidzumii** Nakai in Bot. Mag. Tokyo, XXV (1911) 56; Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4, 482, excl. var. *mandshurica* Pamp.—*A. samamisica* auct., non Bess. (1834); Hulten, Fl. Kamtch. IV, 185.—*A. vulgaris* Kom. in Tr. Spb. Bot. Sada, XXV, 2 (1907) 671, pro parte.—*A. vulgaris* var. *samamisica* Maxim. in Melanges biol. VIII (1872) 535, pro parte.

Perennial. Rhizome woody, slightly thickened in upper part, producing straight, up to 15 cm high, vegetative leafy shoots. Stem erect, sometimes arcuate, (40)50–70 cm high, strong, sulcate, arachnoid-hairy, leafy, almost simple, in upper part with short or somewhat long branches. Leaves greenish-gray above, rather densely covered with appressed arachnoid hairs, whitish-tomentose beneath; lower cauline leaves short-petiolate, usually with pinnately cut auricles, withering early; middle leaves subsessile, 5–8 cm long, broadly ovate or obovate, cuneately narrowed toward base, deeply pinnately divided, their lobes lanceolate, acute, with acute, small teeth; upper leaves sessile, often with auricles, divided into 3–5, usually entire, lanceolate lobes; floral leaves in lower part of inflorescence simple, lanceolate, 2–3 cm long, uppermost smaller, narrowly lanceolate. Capitula campanulate-hemispherical, 3–5 cm long and 4–7 mm in dia, usually approximate in more or less dense, less often lax panicle. Involucre whitish, arachnoid-hairy; involucre bracts oblanceolate, subacute, scarious along margin; outer bracts somewhat shorter than inner. Receptacle plano-convex. Peripheral pistillate florets 12–14, narrowly tubular, with 2 teeth; stigma lobes filiform-linear; disk florets bisexual, 42–44, narrowly cup-shaped-conical, glabrous; anthers linear, on short filaments, their apical appendages sharply angular, basal appendages almost undeveloped; stigma lobes after anthesis strongly recurved, densely ciliate. Flowering August.

Coastal areas, stony slopes on seacoasts, in forests—*Far East*: Kamchatka, Okhotsk, Uda River Area, Ussuri, Sakhalin. *General distribution*: Japan. Described from Japan. Type in Tokyo.

Plants from Gmelin's expedition (1773–1774) originating from Gilyan, and possibly collected by G. von Hoblitz, are preserved in Leningrad.

11. **A. saitoana**, Kitamura in Acta Phyt. et Geobot. VII (1938) 63.—*A. brachyloba* auct. non Franchet; Kom. in Izv. Bot. Sada Akad. Nauk SSSR, XXX, 1–2 (1932) 218.—Kom. and Alis. Opređ. Rast. Dalnevost. Kr. II, 1043.

Perennial. Plant more or less whitish-tomentose; rhizome creeping, cordlike, bearing rather long, straight, leafy, nonflowering shoots. Stem erect, (25)30–65 cm high, simple or with short branches in upper part.

Leaves sessile or short-petiolate, whitish-tomentose beneath, green above, not densely appressed arachnoid-hairy; leaves of nonflowering shoots as also lower and middle cauline leaves 4–5 cm long and 3.5–4.0 cm wide, broadly ovate, with 5- or 7-lobed, scarcely acute teeth; upper cauline leaves smaller, with 3–5-lobed teeth; uppermost leaves simple, lanceolate. Capitula pedunculate, campanulate, 4–5 mm long, approximate in almost simple raceme or in narrowly racemose-paniculate inflorescence. Involucral bracts more or less densely covered with long, arachnoid-hairs, scarious along margin; outer bracts ovate, inner bracts oblate, along margin violet. Receptacle convex. Peripheral florets pistillate, 4–5, filiform-tubular, weakly hairy; stigma lobes long, linear, straight, weakly inclined, exerted from corolla tube; disk florets bisexual, fertile, 25–26, narrowly conical, with 5 teeth; anthers linear, apical appendages long subulate after anthesis, basal appendage sharply angular, anther filaments short; style narrowly linear, long, stigma lobes after flowering linear, arcuate, at apex funnel-like expanded, with profuse squarrose cilia. Achenes 0.8–1.1 mm long, ovoid, terete, dark brown, with longitudinal filiform stripes, apically with roundish smooth areola. Flowering August.

- 449 Forest zone, on dry slopes of [mud] volcanic cones, rock outcrops, oak groves.—*Far East*: Ussuri. *General distribution*: Korea. Described from Korea. Type in Tokyo.

12. **A. komarovii** Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 402.

Perennial. Rhizome short, cord-like. Stem erect, 50–80 cm high, angular-ribbed, appressed-hairy or sub-glabrous, leafy, with short appressed branches in upper part, sometimes with long branches, stem almost simple. Leaves glabrous above, almost coriaceous, whitish- or grayish-arachnoid-tomentose beneath; basal leaves and lower and middle cauline leaves 4–7 cm long and 2.0–2.5 cm wide, lanceolate, subacute, entire or with remote short teeth; floral bracts smaller, narrowly lanceolate, entire. Capitula on short peduncles, upright, campanulate, 3.5–4.0 mm long and 2–3 mm in dia, strongly approximate in dense panicle. Involucral bracts scarious along margin, colored, outer ovate, arachnoid-hairy; inner larger, oblanceolate, glabrous. Peripheral pistillate florets 9, their corollas narrowly tubular; disk florets bisexual, 22, their corollas narrowly cup-shaped, conical, glabrous; anthers not exerted from tube; stigma lobes arcuate after flowering. Achenes to 1 mm long, narrowly oblong, somewhat flat, brown, finely sulcate. Flowering August.

Meadows, on dry slopes in forest zone.—*Far East*: Ussuri. Endemic. Described from Pacific Coastal area. Type in Leningrad.

13. **A. integrifolia** L. Sp. pl. (1753) 848; Bess. Tent. Abrot. 58; DC. Prodr. VI, 114; Turcz. Fl. baic.-dahur. II, 2, 63; Kom. Fl. Manchzh. III, 675 p. p.; Kom. and Alis. Opered. Rast. Dalnevost. Kr. II, 1042; Krascheninn. in Spisok. Rast. Gerb. Fl. SSSR, X, 82; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2815.—*A. integrifolia* var. *typica* f. *genuina* Pamp. in Nuov. Giorn. Bot. Ital. n. s. XXXVI (1930) 478.—*A. vulgaris* var. *integrifolia* Ldb. Fl. Ross. (1844–1846) 585.—**Exs.:** GRF No. 3163.

Perennial. Rhizome not thick, creeping. Stem simple, single, 50–100 cm high, weakly ribbed, usually reddish-violet. Leaves simple, oblong, lanceolate or lanceolate-linear, acuminate, usually deeply lobed-toothed to different degrees, with 1–3 pairs of erect teeth on each side, narrowed toward base, glabrous above or indistinctly pubescent, dark green, finely whitish-tomentose beneath, 5–10 cm long and 1–2 cm wide; floral bracts smaller, usually entire or weakly toothed. Capitula in narrowly paniculate or spicate inflorescence, on lateral, more or less long branches and on main axis of inflorescence on short peduncles, drooping, oblong-campanulate or campanulate, 3–4 mm in dia. Involucral bracts green in middle, brownish-reddish-brown on sides; 450 outer bracts ovate; inner elliptical, along with wide scarious margin. Peripheral florets 14–15, pistillate; corolla narrowly tubular, with 2 teeth; stigma lobes exserted from tube after flowering, narrowly linear, straight or curved; disk florets 27–30, bisexual; corolla conical, with recurved teeth, glabrous; anthers not exserted, lanceolate-linear; apical and basal appendage of anthers narrowly acute; stigma lobes arcuate after anthesis, apically thickened, flat, with long, straight cilia. Flowering August.

Forest zone along banks of rivers, coastal thickets, forest meadows and along edges of grassy marshes.—*Western Siberia:* Ob River Area (Tomsk, Mariinsk); *Eastern Siberia:* Yenisei, Angara-Sayans, Lena-Kolyma (southern part), Dauria; *Far East:* Zeya-Bureya, Uda River Area. *General distribution:* Mongolia, Northern China. Described from Siberia. Type in London.

14. **A. subulata** Nakai in Bot. Mag. Tokyo, XXIX (1915) 8, non Willd. ex Steud. Nom. ed. II, 140, nom. nud.; Kitam. Com. Japon. II, 417.—*A. lavandulaefolia* Nakai Fl. Koreana, II (1911) 29, non DC.—*A. integrifolia* var. *subulata* Pampan. Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4 (1930) 480.—*A. stenophylla* Kitam. in Acta Phyt. et Geobot. V. No. 2 (1936) 97, nom. nov.

Perennial. Rhizome slender, creeping, producing straight, rather long, leafy, vegetative shoots. Stem straight, 45–60 cm high, glabrous or weakly pubescent, leafy, simple or with short branches above. Leaves

linear, linear-lanceolate, acute, entire, involute, glabrous above, whitish-arachnoid-tomentose beneath, sessile, or lowermost leaves short-petiolate, at base with short linear auricles; lower and partly middle cauline leaves withering early, 5–8 cm long and (1.5) 2–5 mm wide, adpressed or somewhat inclined; upper cauline leaves smaller; uppermost floral bracts small, not exceeding inflorescence. Capitula pedunculate or subsessile, campanulate, 4 mm long, uppermost somewhat remote, lower in short branches, in narrowly linear, racemose-paniculate inflorescence. Involucre arachnoid-hairy; involucre bracts scarious on margin; outer bracts ovate, subacute; inner longer, oblanceolate. Peripheral florets pistillate, 10–11; disk florets bisexual, to 11. Flowering August.

Slopes of [mud] volcanic cones, among shrubs in forest zone.—*Far East*: Ussuri. *General distribution*: Northern China, Korea. Described from Korea. Type in Tokyo.

Series 5. Bipinnatilobae Poljak.—Lower cauline leaves twice pinnately cut into broadly lanceolate pinnately divided lobes.

15. *A. rubripes* Nakai in Bot. Mag. Tokyo, XXXI (1917) 112; Kitam. Compos. Japon. II, 426.—*A. venusta* Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4 (1930) 470; Kom. and Alis. Opred. Rast. Dalnevost. Kr. 104; Pampan. in Lavor. Inst. bot. Univ. Cagliari. XL
451 (1940) 570. —*A. vulgaris* var. *parviflora* Maxim. Pr. Fl. Amur. (1859) 160.—*A. vulgaris* γ. *vulgatissima* Kom. Fl. Manchzh. III, 673; Nakai, Fl. Koreana, II, 31; Ling Jong in Contrib. Inst. of Bot. nat. Acad. Peiping. II, 523.

Perennial. Rhizome slender, creeping. Stem erect 75–120 cm high, weakly pubescent or subglabrous, angular-sulcate, leafy, with short branches in upper part. Leaves green and glabrous above, whitish-tomentose beneath; lower cauline leaves petiolate, 7–13 cm long, deeply twice pinnately divided, their lobes broadly lanceolate, acute, lobate-pinnately divided, lobules linear or lanceolate, acute; middle and upper cauline leaves smaller, sessile or short-petiolate, pinnately cut, their lobes narrowly linear, long-acuminate, entire, involute or with occasional linear acute teeth; floral bracts small, not exceeding inflorescence, almost linear, acute. Capitula numerous, strongly appressed, narrowly campanulate, 3.0–3.5 mm long, in narrow, mostly elongated and dense paniculate inflorescence. Involucres arachnoid-hairy; involucre bracts lanceolate, subacute, with wide, scarious margin; inner bracts longer than outer. Peripheral florets pistillate, usually 9–10, their corollas filiform-tubular; disk florets bisexual, 12–14, their corollas narrowly cup-shaped-conical, in upper part purple, with

divergent teeth; anthers exerted from tube, apical appendages of anthers subulate, basal appendages undeveloped; stigma lobes short, slightly divergent, almost straight. Achenes small, 0.6 mm long, narrowly ovate, somewhat flattened, brown, smooth. Flowering August.

Forest zone, in river valleys, among shrubs, meadows, edges of deciduous forests, as weed in old fields.—*Far East*: Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Northern China, Korea. Described from Korea. Type in Tokyo.

Series 6. Angustilobae Poljak.—Leaves pinnately cut or deeply divided into narrowly linear or lanceolate-linear, entire lobes, or lobes with short acute teeth, or leaves even entire, narrowly linear.

16. *A. argyi* Lev. and Van. in Fedde Repert. VIII (1910) 138; Pamph. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4, 450–452; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1036; Kitam. Comp. Japon. II (1940) 412.—*A. vulgaris* var. *incana* Maxim. Prim. Fl. Amur. (1859) 160.—*A. vulgaris* var. *incanescens* Franch. in Nuov. Arch. Mus. V, 2 ser. (1884) 169.—*A. nutans* Nakai in Journ. Coll. Sc. Univ. Tokyo, XXXI (1911) 33.—*A. leucophylla* auct. non Turcz.: Kom. Fl. Manchzh. III, 674.

Perennial. Rhizome creeping. Stems erect, 85–120 cm high, angular-sulcate, grayish-arachnoid-hairy, leafy, with short branches in upper part. Leaves, except the uppermost, petiolate, punctate-glandular, dull green above, more or less densely appressed hairy, white-tomentose
452 beneath; lower and middle cauline leaves 6–8(9) cm long and 5–7 cm wide, pinnately cut, their lobes lanceolate, with short, subacute teeth or entire; upper cauline leaves somewhat smaller, pinnate or ternate, their lobes narrowly lanceolate, entire or with occasional small teeth, or uppermost floral bracts small, not exceeding inflorescence, linear-lanceolate. Capitula sessile or on short peduncles, upright, campanulate or almost oblong, 2.5–3.0 mm long, in narrowly pyramidal panicle. Involucres arachnoid-hairy; involucre bracts scarious along margin, colored; outer bracts ovate, somewhat smaller than inner narrowly obovate. Peripheral florets pistillate, 10, their corollas filiform-tubular, stigma lobes filiform, linear; disk florets bisexual, 10, their corollas narrowly campanulate, conical, punctate-glandular; stigma lobes short, truncate, strongly recurved after anthesis.

Forest zone, in meadows, scrubs, deciduous forests, as well as old fields.—*Far East*: Zeya-Bureya, Ussuri. *General distribution*: Northern China, Korea. Described from northern China. Type in Paris.

17. **A. montana** Pamp. in Nuov. Giorn. Bot. Ital. n. s. XXXVI (1930) 461; Kitam. Comp. Japon. II, 427; Hara, Enum. Spermatoph. Japon. II, 122.—*A. vulgaris* var. *indica* f. *montana* Nakai in Bot. Mag. Tokyo, XXXVI (1912) 104.—*A. vulgaris* var. *kamtschatica* Nakai op. cit. (1912) 104, non Bess.—*A. gigantea* Kitamura in Acta Phyt. et Geobot. II (1933) 172; Hara Bot. Mag. Tokyo, LII, 4, includ. f. *montana* (Nakai), f. *electa* (Pamp.) and f. *shikotanensis* (Kitam.) Hara.—*A. shikotanensis* Kitamura in Acta Phyt. et Geobot. III (1934) 128.—*A. gigantea* var. *shikotanensis* (Kitam.) Tatewaki, Rep. Veg. Shikotan (1940) 21.

Perennial. Stem 80–95 cm high, cylindrical, erect, sulcate, leafy, in basal part glabrous, above weakly hairy. Leaves dark green and glabrous or weakly pubescent above, whitish-arachnoid-tomentose beneath; lower and middle cauline leaves petiolate, 12–17(20) cm long and 6–10(12) cm wide, deeply (but not up to midrib) pinnately divided, lobes 5, lanceolate, acute, entire or sometimes with short acute teeth; upper leaves shorter, 3–8 cm long, short-petiolate, simple, lanceolate or narrowly lanceolate, acute, longer than floriferous branches or somewhat shorter; uppermost floral bracts small, narrowly linear or lanceolate-linear, usually exceeding capitula. Capitula sessile, ovoid, 2.6–3.0 mm long and 1.5–1.8 mm in dia, dense, spicate on branches, usually forming long paniculate inflorescence. Involucres cup-shaped, arachnoid-hairy; involucral bracts with wide scarious border; outer bracts ovate, acuminate, dorsally green; inner large, oblong-ovate. Receptacle convex, short-clavate, glabrous. All florets fertile; peripheral florets 8, pistillate, their corollas narrowly tubular; stigma lobes long, 453 narrowly linear; disk florets bisexual, 5, their corolla tubular-conical, glabrous, anthers on short filaments, linear, their apical appendages acute, stigma lobes arcuate after flowering, short, densely ciliate at apex. Flowering August.

Forest meadows.—*Far East*: Ussuri, Sakhalin (and Kuril Islands). *General distribution*: Japan. Described from Honshu Island. Type in Tokyo.

18. **A. lavandulifolia** DC. Prodr. VI (1837) 110; Kom. Fl. Manchzh. III, 678; Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4 (1930) 466 p. p.; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1041; Kitam. Comp. Japon. II (1940) 411.—*A. vulgaris* Maxim. in Bull. Acad. Sc. Pétersb. VIII (1872) 536, pro parte.

Perennial. Rhizome slender. Stem erect, 50–80 cm high, angular-sulcate, short-pubescent, sometimes subglabrous, leafy, usually with short adpressed branches in upper part, less often with long, weakly spreading branches. Leaves glabrous above, grayish-tomentose beneath;

lower cauline leaves withering early; middle cauline short-petiolate, 5–8 cm long, pinnately cut, their lobes 2.0–3.0 (4.5) cm long and 2–3(4) mm wide, linear, simple, acuminate, gradually narrowed toward base; upper leaves sessile, smaller, with fewer lobes (usually 3–5); uppermost floral bracts small, not exceeding inflorescence, narrowly lanceolate-linear. Capitula numerous, subsessile, upright, narrowly campanulate or almost narrowly cylindrical, 2.5–3.0 mm long, in dense, narrowly pyramidal or linear-paniculate inflorescence. Involucres short arachnoid-hairy; involucre bracts lanceolate-elliptical, scarious along margin. All florets fertile; peripheral florets pistillate, 5–6, their corollas almost filiform-tubular; disk florets bisexual, 5–6, their corollas narrowly cup-shaped-conical, glabrous, usually with recurved teeth, stigma lobes strongly recurved after flowering, not exerted from tube. Flowering August.

Forest zone, in meadows, scrubs, often in old fields and weedy places.—*Far East*: Ussuri. *General distribution*: Northeastern China, Korea. Described from China. Type in Geneva.

19. **A. umbrosa** Turcz. ex DC. Prodr. VI (1837) 111.—*A. umbrosa* var. *typica* Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4 (1930) 448; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1041.—*A. vulgaris* var. *umbrosa* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 52; Turcz. Fl. baic.-dahur. II, 2, 63.—*A. selengensis* β . *umbrosa* Ldb. Fl. Ross. II, 2 (1844–1846) 584.—*A. selengensis* *lusus umbrosa* Rgl. Fl. Ussur. (1862) 96.—*A. vulgaris* Kom. Fl. Manchzh. III (1907) 673, pro parte.

454 Perennial. Rhizome short, slender, woody. Stem 65–95 cm high, erect, ribbed-sulcate, sparsely covered with inconspicuous appressed hairs, branched above, sometimes almost simple, leafy. Leaves green and mildly appressed-hairy above, whitish-arachnoid-tomentose beneath; basal and, in part, middle cauline leaves 8–12 cm long, short-petiolate; petioles at base with lanceolate auricles, their lamina broadly ovate or wide, deltoid-ovate, pinnately cut; lobes linear, 5–7 cm long and 3–6 mm wide, acute, entire or with 1–2 short, acute, linear teeth; upper cauline leaves divided into 3 lobes; uppermost floral bracts linear, more or less exceeding inflorescence. Capitula pedunculate or sessile, campanulate, 3.5–4.0 mm long and 2.0–2.5 mm in dia, densely crowded on branches, usually forming dense pyramidal inflorescence. Involucres whitish, arachnoid-hairy; involucre bracts elliptical, scarious along margin; outer bracts smaller than inner. Peripheral florets pistillate, 5–8, their corollas filiform-tubular; stigma lobes narrowly linear, exerted from corolla; disk florets 13–18, campanulate, in upper part purple-

pink, scatteredly glandular, their teeth broadly deltoid, slightly recurved; anthers somewhat exerted from tube, linear, apical appendages acute, basal appendages sharply angular; stigma lobes short, oblong-linear, recurved apically, densely ciliate. Flowering August.

Forest zone in river valleys, wet meadows, scrubs, sometimes along sandy banks, and in old fields.—*Eastern Siberia*: Dauria; *Far East*: Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Mongolia, northern China. Described from Selenga River. Type in Leningrad.

20. *A. selengensis* Turcz. ex Besser in Nouv. Mém. Soc. Nat. Mosc. III (1834) 50; DC. Prodr. VI, 112; Ldb. Fl. Ross. II, 2, 584; Turcz. Fl. baic.-dahur. II, 2, 62; Maxim. Pr. Fl. Amur. 160; Nakai, Fl. Korean. II, 32; Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI, No. 4, 473; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1041.—*A. vulgaris* var. *selengensis* lusum *serratifolia* and lusum *typica* Rgl. Fl. Ussur. (1862) 96.—*A. vulgaris* var. *selengensis* Maxim. in Bull. Acad. Sc. Pétersb. VIII (1872) 536.—*A. vulgaris* α. *selengensis* f. *serratifolia* Kom. Fl. Manchzh. III (1907) 673.—*Exs.*: GRF No. 3165.

Perennial. Rhizome 0.4–0.6 cm thick, woody. Stem straight, 75–120(130) cm high, light green or reddish brown, usually glabrous, sulcate, simple or almost simple, leafy. Leaves green and glabrous above, whitish-arachnoid-tomentose beneath. Lower and in part, middle cauline leaves withering at anthesis, petiolate, 8–12 cm long, lamina broadly ovate or almost ovate, pinnately cut, with 5 lobes, less often 7, linear or linear-narrowly lanceolate, acute, mostly 5–7(8) cm long and 3–5 mm wide, with short acute teeth, in part, entire; upper cauline leaves sessile, divided into 3–5 lobes or simple, linear narrowly lanceolate; uppermost floral leaves, short, not exceeding inflorescence, linear. Capitula pedunculate or sessile, campanulate, 3–4 mm long and
455 2.0–2.5 mm in dia, strongly crowded, on short, adpressed or weakly spreading branches, usually forming long, narrow, paniculate inflorescence. Involucres weakly arachnoid-hairy or subglabrous; involucre bracts with wide, scarious border, outer bracts roundish or oval, acuminate, inner larger, broadly oblanceolate, somewhat colored. Peripheral pistillate florets 8–12, their corollas filiform-tubular; disk florets bisexual, 10–12; their corollas conical, punctate-glandular; anthers linear, apical appendage acute, basal appendages roundish-cuneate; stigma lobes arcuate after flowering. Achenes 1.2 mm long, ovate, somewhat flattened, brown, smooth, apically with uneven, weakly stretched margin.

Forest zone in river valleys, in floodplain meadows, along sandy-gravelly banks, forest glades, burned-over forest areas.—*Eastern Siberia*: Dauria; *Far East*: Zeya-Bureya, Uda River Area, Ussuri.

General distribution: Mongolia, northeastern China. Described from vicinity of Selenginsk. Type in Leningrad.

Note. *A. selengensis* Turcz. is reported for the flora of North America by Rydberg (Rydberg, *North Am. Fl.*, 34, part 3 (1918) 48). Judging from the diagnosis, the American plant differs from the eastern Siberian plant by fewer peripheral florets, glandular pubescence and shape of the corolla, much larger capitula, and the shape and size of the leaf lobes. On this basis, it can be inferred that this is some other species of wormwood growing in North America, which is mistakenly called *A. selengensis* Turcz. ex Bess.

Section 2. *Stellerianum* (Rydb.) Poljak. comb. n.; Rydb. in *North Amer. Fl.* XXXIV, 3 (1918) 277 pro serie.—Capitula relatively large, to 8–10 mm wide; anthers with filaments sparsely and not densely covered with very slender hairs; achenes narrowly oblong-linear, smooth, in hollow, membranous, semitransparent, saccate pericarp.

21. ***A. stelleriana*** Bess. in *Nouv. Mém. Soc. Nat. Mosc.* III (1834) 79; DC. *Prodr.* VI, 119; Ldb. *Fl. Ross.* II, 592; Maxim. in *Bull. Acad. Sc. Pétersb.* VIII, 534; A. Gray, *Synopt. Fl. North Am.* I, 2, 371; Kom. *Fl. Manchzh.* III, 668; Rydberg, *North Am. Fl.* 34, part 3, 277; Hall and Clements. *The Phylogenet. method in Taxon.* 67; Pampan. in *Nuov. Giorn. Bot. Ital.* n. s. XXXIV, 704; Kom. *Fl. Kamch.* III, 154; Hult. *Fl. Kamtsch.* IV, 185; Kom. and Alis. *Opred. Rast. Dalnevost.* Kr. II, 1036; Sugaw. III. *Fl. Kamtsch.* IV, 1814; Hara *Enum. Spermatoph. Japonic.* II, 125.—*A. stelleriana* var. *sahalinensis* Nakai in *Bot. Mag. Tokyo.* XXVI (1912) 102.—**lc.:** Bess. loc. cit. tab. V; Hall. and Clements. loc. cit. tab. 5, fig. 1–7; Sugaw. op. cit. 831.

456 Perennial. Whole plant whitish, hairy-tomentose. Rhizome slender, creeping or obliquely upright, producing leafy nonflowering shoots. Stem single, less often 2–3, rather thick (3–5 mm), (15)20–55 cm high, erect or ascending, leafy. Leaves weakly pubescent above, less often subglabrous; leaves of nonflowering shoots and lower cauline leaves petiolate, 3–7 cm long and 1.5–3.0 cm wide, oval or lobate, lobate-toothed, divided into 3–5(7) oblong-roundish lobes, or scarcely acuminate; middle cauline leaves short-petiolate, pinnately divided or pinnately cut, more often with entire lobes; upper floral bracts pinnate, ternate or undivided, lanceolate-linear. Capitula cup-shaped, 5–8 mm long and 4–6 mm wide, erect or inclined, pedunculate, all or only upper capitula crowded in usually dense, spicate inflorescence, but middle and lower capitula 2–8 on long appressed branches. Involucral bracts whitish-arachnoid-hairy, linear or narrowly lanceolate, brownish-scarious, imbricate; receptacle flat. Peripheral florets pistillate, usually

16, their corollas almost filiform, conical-tubular; stigma lobes distinct, filiform-linear, erect, subobtusate; disk florets bisexual, 27–30, their corollas tubular-conical, glabrous or weakly hairy, sometimes at base hairy; anthers with filaments sparsely covered outside with very fine hairs visible only at high magnification; style long, thickened in upper part, with stigma lobes erect or recurved after anthesis, apically ciliate. Mature achenes narrowly oblong-linear, 3–4 mm long and 0.3–0.4 mm wide, smooth, dark brown, in membranous, semitransparent, saccate pericarp to 1.0–1.3 mm wide. Flowering August. (Plate XX, Fig. 1).

In river mouths and usually along sandy-gravelly seacoasts, sometimes on rubbly slopes near the sea.—*Far East*: Ussuri, Uda River Area, Okhotsk, Sakhalin, Kamchatka. *General distribution*: Scandinavia (Norway), Japan, North America (Alaska). Described from Kamchatka. Type in Kiev.

Section 3. Abrotanum Bess. in Bull. Soc. Nat. Mosc. I (1829) 222.—*Abrotanum* (Bess.) Rydb. North Am. Fl. 34, part 3 (1916) 247, pro subgen.—Semishrubs, less often perennials, with woody tap root, short, perennial, woody shoots above and more or less numerous, usually twiglike floriferous stems; leaves twice- or thrice pinnately dissected into filiform-linear, linear, or linear-lanceolate pinnae, green, glabrous or hairy beneath, less often whitish from dense pubescence; capitula globose or hemispherical; receptacle glabrous.

Series 1. Ponticae Rydb. *ibid.*—Leaf lobes filiform-linear, linear, or linear-lanceolate.

22. *A. abrotanum* L. Sp. pl. (1753) 845; Rydb. North Am. Fl. 34, part 3, 280; Hall and Clements. *Artemisi*: 49; Hegi, III, Fl. VI, 2, 634.—*A. paniculata* Lam. *Encycl. meth.* I (1783) 265, non Bess.; 457 Poljak. in Majeovski, Fl. 587. — *A. procera* Willd. Sp. pl. (1800) 1818; Bess. in *Nouv. Mém. Soc. Nat. Mosc.* III, 29; Ldb. Fl. alt. IV, 77; DC. *Prodr.* VI, 108; Ldb. Fl. Ross. II, 579; Boiss. Fl. or. III, 370; Kryl. Fl. Alt. III, 643; Fedtsch. *Perech. Rast. Turk.* IV, 197; Grossh. Fl. Kavk. IV, 140; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 359; Kryl. Fl. Zap. Sib. XI, 2803.—*A. herbacea* Willd. Sp. pl. III, 3 (1800) 1828; Bess. *op. cit.* p. 33; Ldb. Fl. Ross. II, 579.—*A. proceraeformis* Krasch. in *Otchet o Rabote Pochv.-bot. Otryada Kazakhstan. Eksp. Akad. Nauk SSSR* (1930) 274; *Spisok. Rast. Gerb. Fl. SSSR*, X, 82; Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 360; Kryl. Fl. Zap. Sib. XI, 2802.—*Exs.*: GRF No. 1024a, 3162 (sub *A. procera*), *Herb. Norm.* No. 4893.

Perennial. Semishrub, 70–150 cm high, with rather thick, woody root. Stems erect, woody at base, simple (not branched). Leaves short appressed hairy beneath, later green, glabrous, petiolate, ovate, usually 4–8 cm long and 3–6 cm wide, twice or thrice pinnately dissected into filiform-linear, 5–15 mm long and 0.2–1.0 mm wide lobes; floral bracts less divided to simple pinnate, but uppermost leaves undivided, generally exceeding inflorescence. Capitula ovoid-globose or subglobose, 2.0–2.5 mm wide, drooping, crowded in corymbs on lateral branches of long, narrow, dense paniculate inflorescence. Involucre weakly short-hairy; outer involucral bracts herbaceous, oblong-elliptical or oblong-ovate; inner elliptical, with wide, incised, scarious border. Peripheral florets pistillate, 8, their corollas narrowly tubular, broadened toward base, bidentate, glabrous, punctate glandular hairy; stigma lobes exserted, linear, truncate, usually recurved; disk florets 14–16, their corollas tubular, punctate-glandular hairy, glabrous or with sparse hairs outside of teeth; anthers slightly exserted from tube after anthesis, linear, apical appendages sharply angular, basal appendages short, roundish; stigma lobes shorter, linear, apically thickened, ciliate, after anthesis spreading. Achenes to 1.2 mm long, ovoid-oblong, somewhat flattened, sulcate, with a roundish areola at apex, and scarcely toothed border. Flowering July to August. (Plate XXIII, Fig. 1).

Forest and often forest-steppe zones, along banks of rivers, strips of riverine deciduous forest, flood-plains, less often wet meadows, edges of deciduous forests, sometimes as weed in vicinity of dwellings.—*European part*: Dvina-Pechora, Ladoga-Ilmen, Volga-Kama, Upper Volga, Middle Dnieper, Volga-Don, Lower Don, Trans-Volga, Lower Volga, Black Sea Region; *Caucasus*: Ciscaucasia southern Transcaucasia; *Western Siberia*: Upper Tobol, Ob River Area, Irtysh, Altai; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region. *General distribution*: Western Mediterranean Region, Central Europe, Balkans-Asia Minor, Armenia and Kurdistan. Described from Dalmatia. Type in London.

Note 1. The confusion relating to the name of this species was due partly to the appearance after Linneaus of the new names, *A. paniculata* Lam. and *A. procera* Willd. Of these, the second one was accepted by
458 many authors of the Russian flora despite the absence in fact of a basis for distinguishing it from *A. abrotanum* L. This is clearly confirmed by the collections in the Botanical Institute of the Academy of Sciences of the USSR. Although Krascheninnikov (*Mat. po Istor. Fl. i Rast. SSSR*, No. III, 1958, p. 73) mentions the existence of "intermediate" forms between *A. abrotanum* and *A. procera*, they are so insignificant (not beyond the limits of an ecological form) that they cannot serve as the basis for segregating the separate species, *A. procera* Willd.

Note 2. *A. proceraeformis* Krasch. differs from *A. abrotanum* L. by the somewhat smaller leaves (2–5 and not 4–8 cm long), the size of the leaf lobes (not 5–15, but 2–4(7) mm long), a somewhat shorter stem (not 70–150 but 40–85 cm), and also by the size of the capitula, i.e., by purely quantitative characters.

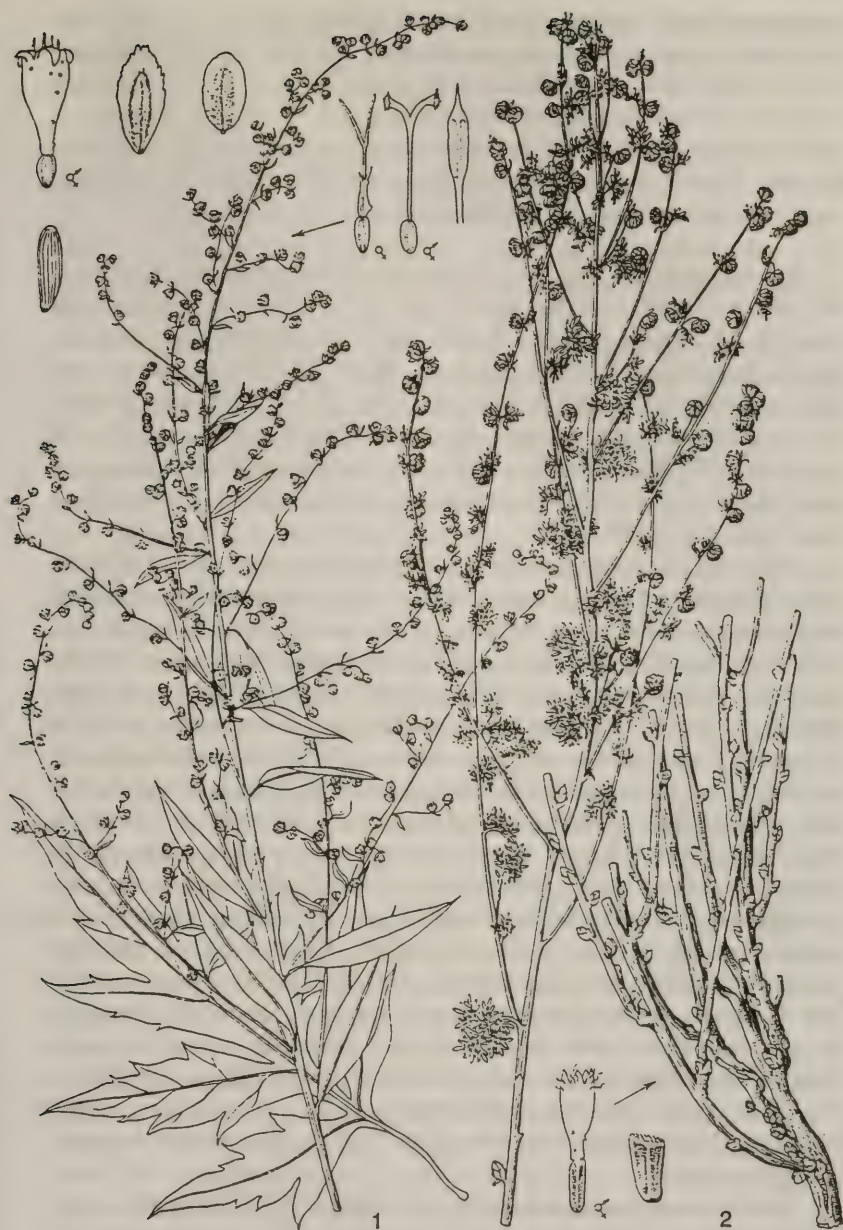
Economic Importance. According to L. Kazakevich and O. Sobolevskaya (1928), the essential oil has the following constants: D_4^{20} –0.9214; D_4^{15} –0.9166; α_D –9.3°; n_D^{20} –1.4692. Dissolves in a 0.5 volume of 80% alcohol, acid number—0.74–1.32; ester number—20.46–29.81; ester number after acetylation—55.72–72.58.

According to M.I. Goryaev (1951), the yield of essential oil from the plants collected near the village of Irgiz was 0.32%. The oil is orange-yellow with a sharp, pleasant smell. The constants of the oil are: D_{20}^{20} –0.948; n_D^{40} –1.4670; it dissolves in 70% alcohol in the ratio 1:3, in 80% alcohol—1:1 and in 90% alcohol—entirely. Reaction to aldehyde—positive, reaction to alcoholic solution of $FeCl_3$ —negative.

According to I.V. Larin (1956), cattle do not relish this wormwood.

23. *A. chamaemelifolia* Vill. Pros. 32 and Fl. Delph. III (1785) 250; MB. Fl. taur.-cauc. II, 296; DC. Prodr. VI, 108; Ldb. Fl. Ross. II, 380; Boiss. Fl. or. III, 370; Grossh. Fl. Kavk. IV, 140; Grossh. Opr. Rast. Kavk. 464.—*A. stechmanniana* β . *armeniaca* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 35; DC. Prodr. VI, 109; Ldb. Fl. Ross. II, 580.—*A. lobelii* All. ex Bess. op. cit. 32.—*A. chamaemelifolia* γ . *armeniaca* Hohenack. Enum. Talüsch. (1838) 57.—**lc.**: Vill. Fl. Delph. tab. 35; Rchb. Ic. Fl. Germ. tab. 1034.

Perennial. Root relatively thicker, woody. Stem basally woody, branched, covered with dark brown bark, producing divergent, vegetative, leafy shoots, stems few or numerous, erect, brown, short-pubescent, fertile, with short branches in upper part. Leaves short-arachnoid-pubescent, hairy or subglabrous, green; basal leaves petiolate, withering before anthesis, 2.0–3.5 cm long, thrice pinnately cut, their terminal lobes linear-filiform, 2–4 mm long, sub-obtuse, with very short, acuminate, cartilaginous tip; middle cauline leaves sessile, twice pinnately cut, upper leaves less completely divided; bracteal leaves undivided. Capitula globose, 2.5–4.0 mm in dia, on peduncles, inclined or drooping, crowded or not lax, on short branches adpressed to stem, in narrowly corymbose-paniculate inflorescence. Outer involucre bracts oblong-ovate, somewhat hairy, with narrow scarious border; inner bracts somewhat larger, ovate, glabrous, with wide scarious border. Receptacle glabrous. Peripheral florets 10–12, pistillate, their corollas tubular with 3 obtuse teeth, glabrous, stigma lobes linear, divergent with border, obtuse; disk florets bisexual, 30–35, their corollas obpyriform with



1 — *Artemisia silvatica* Maxim., Upper part of the plant and lower leaf; bisexual disk floret, inner involucre bract, achene, peripheral pistillate floret, pistil, stamen. 2 — *A. persica* Boiss., disk floret, achene.

convergent teeth; anthers linear, apical appendages of anthers subulate-linear, basal appendages less sharply angular; stigma lobes not exerted from tube, short, linear, with border, obtuse, ciliate. Achenes prismatic, 5-angled, apically with a flat areola. Flowering August.

Mountain steppes and meadow slopes.—*Caucasus*: Ciscaucasia, Eastern, Western, and Southern Transcaucasia, Dagestan. *General distribution*: Armenia and Kurdistan, Iran. Type in Paris.

24. **A. pontica** L. Sp. pl. (1753) 847; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 37; Ldb. Fl. Alt. IV, 77; DC. Prodr. VI, 109; Ldb. Fl. Ross. II, 580; Boiss. Fl. or. III, 369; Kryl. Fl. Alt. III, 644; Fedtsch. Perech. Rast. Turk. 4, 197 p. p.; Rydb. North Am. Fl. 34, part 3, 280; Hall and Clements. Artemisi (1923) 52; Hegi, III. Fl. VI, 2, 644; Grossh. Fl. Kavk. IV, 141; Krascheninn. Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 359; Kryl. Fl. Zap. Sib. XI, 2803.—*A. balsamita* Willd. Enum. h. berol. Suppl. (1822) 57.—*A. altaica* Desf. Hort. Paris (1829) 160.—**Exs.**: GRF No. 3161, 3280.

Perennial. Rhizome creeping, 1.3–3.0 mm thick. Stem 40–100 cm high, herbaceous, erect, except in lower part densely leafy, with short hairs. Lower cauline leaves petiolate, others sessile, 2–5 cm long and 1–3 cm wide, grayish-green above, with scattered appressed hairs, whitish or grayish-tomentose beneath, twice or almost thrice pinnately cut, lobes apically somewhat broadened and then acuminate, 2–6 mm long and 0.5–1.0 mm wide, leaf rachis with few small, undivided lobes in upper part between lobes, often lacking them; lower bracteal leaves pinnately cut, upper undivided, linear, not exceeding inflorescence. Capitula subglobose, 2.5–4.0 mm in dia, drooping, crowded in narrowly paniculate inflorescence. Involucres whitish, finely tomentose; outer
462 involucre bracts herbaceous, oblong-ovate; inner elliptical, with wide scarious margin. Peripheral florets pistillate, 12, their corollas narrowly tubular, broadened toward base, punctate-glandular; stigma lobes exerted from tube, linear, truncate, recurved; disk florets numerous (40–45), bisexual, in part, undeveloped, their corollas conical, glabrous, less often hairy, punctate-glandular; anthers on short filaments, linear, apical appendages of anthers sharply angular, basal appendages almost indistinct; stigma lobes short, not exerted from tube, short-ciliate, after anthesis recurved. Flowering August.

Forest-steppe and steppe zones, in thickets of shrubs, birch groves (small islands in forest-steppe), ravines, river valleys on steppes, and meadow-saline depressions, steppe slopes.—*European part*: Volga-Kama, Volga-Don, Trans-Volga, Middle Dnieper, Lower Don, Black Sea Region, Bessarabia, Crimea, *Caucasus*: Ciscaucasia; *Western Siberia*: Upper Tobol, Irtysh, Ob River Area, Altai (foothills). *General*

distribution: Central Europe, Balkans-Asia Minor; in cultivation in southern Canada and the USA. Described from Hungary. Type in London.

25. **A. macrantha** Ldb. in Mém. Acad. Pétersb. V. (1815) 573; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 34; Ldb. Fl. Alt. IV, 76; DC. Prodr. VI, 109; Ldb. Fl. Ross. II, 581; Fedtsch. Perech. Rast. Turk. IV, 193; Krascheninn. in Fl. Yugo-Vost. XI, 2805.—**lc.**: Ldb. Ic. Fl. Ross. V, f. 452; Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, fig. 686.—**Exs.**: GRF Nos. 1226, 3160a, b, c, 3279.

Perennial. Rhizome creeping. Stem woody, solitary or few, erect, 20–100 cm high, except lower part densely leafy, with fine appressed hairs. Leaves, except basal, sessile, 4–8 cm long and 2–7 cm wide, almost ovate, densely covered with whitish, fine hairs beneath, scatteredly hairy and grayish-green above or subglabrous, green, twice, less often almost thrice pinnately cut, with common pectinate rachis, i.e., with small undivided lanceolate-linear lobules between lobes; lobes divergent at acute angle; terminal lobe lanceolate-linear, scarcely acuminate, sometimes weakly falcate, 2–10 mm long and 0.5–1.5 mm wide; bracteal leaves pinnately cut, usually exceeding reduced branches of inflorescence projecting from it, uppermost bracteal leaves undivided, lanceolate-linear. Capitula subglobose or hemispherical, 4–7 mm wide, drooping, clustered in corymbs on short branches forming narrowly paniculate inflorescence. Involucres whitish-tomentose; outer involucral bracts lanceolate-oblong, herbaceous; inner bracts larger, roundish-ovate, obtuse, with wide brownish scarious margin. Receptacle plano convex, smooth. Peripheral florets pistillate, 23, their corollas narrowly tubular, punctate-glandular, stigma lobes exerted from tube, linear, truncate, after anthesis arcuate; disk florets bisexual, 34, their corollas narrowly cup-shaped-tubular, punctate-glandular, hairy outside of teeth, glabrous below, anthers linear, apical appendage of anthers acute, basal appendage subacute, stigma lobes after anthesis arcuate, short-ciliate. Achenes to 2 mm long, oblong-ovoid, sulcate, brown. Flowering August.

Steppe-meadows, thickets of shrubs, near steppe birch groves (small islands in forest-steppe), edges of pine forests, stony steppe slopes.—*European part*: Volga-Kama, Trans-Volga; *Western Siberia*: Upper Tobol, Ob River Area, Irtysh, Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria, Lena-Kolyma. *General distribution*: Northern Mongolia (Lake Khubsugul area). Described from Siberia. Type in Leningrad.

26. **A. adamsii** Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 27; DC. Prodr. VI, 107; Ldb. Fl. Ross. II, 577; Maxim. in Bull. Acad. Sc. Petersb. VIII, 531.

Perennial. Root relatively slender, woody. Stem woody at base, usually branched, with dark brown bark, producing short, divergent vegetative leafy shoots, few, erect, rather slender, usually arachnoid-hairy, branched, fertile, 15–30(35) cm high shoots. Leaves green, punctate-glandular, sparsely tomentose; lower and middle cauline leaves petiolate, 2–4 cm long, their laminas oblong or elliptical, twice or thrice pinnately cut, terminal lobe filiform, subobtusely, 2–4(6) mm long; upper leaves sessile, less complexly divided; bracteal leaves linear-filiform. Capitula globose, 2–4 mm in dia, pedunculate, drooping, usually crowded on branches, in narrowly paniculate inflorescence. Involucral bracts with wide scarious border; outer bracts ovate-oblong, with short hairs, inner roundish or broadly ovate, glabrous. Receptacle convex, hemispherical, smooth. Peripheral florets pistillate, usually 11–12, narrowly tubular, somewhat broadened toward base, punctate-glandular, their stigma lobes slightly exerted from tube, linear, divergent; disk florets bisexual, numerous (40–44), their corollas narrowly cup-shaped-conical, glabrous; anthers lanceolate-linear, apical appendages sharply angular, basal appendages much smaller, acute; style almost a half as long as stamens, stigma lobes linear, straight, short-ciliate, divergent. Achenes to 1.2 mm long, oblong-conical, somewhat flattened, apically with round convex areola, with border on one side along margin. Flowering August. (Plate XXIV, Fig. 1).

River valleys, lakes, on alkaline and saline-meadow areas, rubbly and clayey steppe slopes of [mud] volcanic cones and mountains.—*Eastern Siberia*: Angara-Sayans, Dauria. *General distribution*: Mongolia. Described from Selenga and Baikal. Type in Kiev.

464 **Note.** Erroneously reported by Fedtschenko (*Perech. Rast. Turk.*, V (1911) 196) for Akmolinsk (now Tselinograd) Region.

Series 2. Vestitae Poljak.—Semishrub; terminal lobes of leaves linear-lanceolate or lanceolate, margins serrate or entire.

27. **A. gmelinii** Web. ex Stechm. Dissert. de Artem. (1775) 17; DC. Prodr. VI, 106; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR. XI, 41; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2790.—*A. gmelinii* var. *legitima* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 26.—*A. gmelini* Web. var. *intermedia* (Ldb.) Krasch. op. cit. 2790.—*A. messerschmidtiana* Bess. cum var. *viridis* Bess. op. cit. 27, 28; DC. op. cit. 107; Nakai, Fl. Korean. II, 31.—*A. sacrorum* Ldb. in Mém. Acad. SC. Pétersb. V (1815) 571; Kryl. Fl. Alt. III, 642 p. p.—*A. sacrorum* β. *intermedia* Ldb. Fl. Ross. II (1844–1846) 578; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II (1932) 1042.—*A. sacrorum* var. *intermedia* f. *incana* Ldb. op. cit. 578.—*A. sacrorum* var. *intermedia* Ldb. f. *nivea* and var. *minor* Ldb. f. *vestita* Kom. Fl. Manchzh. III

(1907) 664.—*A. sacrorum* var. *latiloba* Ldb. f. *incana* and f. *intermedia* Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXIV (1927) 686; 688; Sugawara, Fl. Saghal. IV, 1809.—*A. iwayomogi* Kitamura in Acta Phyt. et Geobot. VII, 2 (1938) 64.—**lc.**: Gmel. Fl. Sib. II, pl. 56, f. I–V; Ldb. Ic. pl. Fl. Ross. V (1834) f. 470; Kom. and Alis. op. cit. plate 309.—**Exs.**: GRF Nos. 3276, 1024.

Perennial. Semishrub, 50–100 cm high. Root woody, thick, to 3 cm, at collar bearing perennial, woody, more or less erect or ascending, branched shoots, with brownish gray peeling bark. Stems (branches) herbaceous, rather numerous, erect, dull-violet or brownish, glabrous or in upper part weakly pubescent. Leaves glandular-hairy, green and glabrous or weakly pubescent above, grayish- or whitish-tomentose beneath from appressed dense hairs or on both sides whitish tomentose (var. *messerschmidtiana* (Bess.) Poljak.), except upper leaves petiolate, lower leaves with auricles at base, 3–15 cm long and 1–8 cm wide, lamina ovate or oblong-ovate, twice pinnately cut, lobes lanceolate, pinnately cut into lanceolate or linear-lanceolate, serrate- or entire lobes; part of petioles also with similar lobes; upper cauline leaves much smaller, petiolate or sessile, uppermost bracteal leaves simple pinnate or entire, linear. Capitula subglobose, 2.0–3.5 mm wide, drooping, in short corymbs, aggregated into more or less dense narrow panicle. Outer involucre bracts densely hairy or subglabrous, lanceolate; inner bracts elliptical, with wide, scarious border. Peripheral florets 465 pistillate, fewer (10–12), their corollas narrowly tubular, glabrous, punctate-glandular, stigma lobes exerted from tube, linear, truncate; disk florets bisexual, numerous, their corollas conical, punctate-glandular; anthers oblong-lanceolate, apical appendages of anthers obtuse, basal appendages short, acute, stigma lobes broadly linear, short, at apex long-ciliate. Achenes 1.5 mm long, narrowly oblong-ovoid or narrowly conical, longitudinally sulcate, apically with flat, roundish areola with goffered edge. Flowering August. (Plate XXIII, Fig. 2).

Open coniferous and deciduous forests, forest meadows and glades.—*Western Siberia*: Ob River Area, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria, Lena-Kolyma; *Far East*: Zeya-Bureya, Uda River Area, Ussuri, Sakhalin; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Northern China, Mongolia. Described from Lena and Angara rivers. Type in Berlin, co-type in Leningrad.

Note 1. As regards the specimens issued under No. 3276 (GRF), Krascheninnikov notes that the original description and the drawing of *A. gmelini* Web. ex Stechm. are given in Gmelin's flora, but the binomial name of this species was used for the first time by Weber, whose manuscript was used by Stechmann for his monograph on wormwoods. However, Ledebour, in 1812, while describing a number of Siberian

wormwoods, established a new species, *A. sacrorum* Ldb., which he later accepted in the Flora of Altai, although this species should have been identified with *A. gmelini* Web. ex Stech. The authentic specimen that evidently has served as the type for Gmelin's drawing in the Flora of Siberia convinces me of this. Judging from the label affixed to this very specimen written in Besser's own hand, Besser considered this form to be his own *A. gmelini* var. *legitima* Bess. The name proposed by Ledebour is rather firmly established in the Russian literature. All the same, according to the rules of nomenclature, the much older name proposed by Weber must be given preference.

Note 2. Hooker (*Fl. Br. Ind.*, 1882) reports this species for western Tibet; however, on the basis of the description, the Tibetan plant most probably belongs to *A. vestita* Wall. ex DC.

28. *A. santolinifolia* Turcz. ex Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 87; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, XI, 43; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2791.—*A. sacrorum* var. *minor* Ldb. Fl. Alt. IV, (1833) 72; Ldb. Fl. Ross. II, 578; Fedtsch. Perech. Rast. Turk. IV, 196; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 358.—*A. sacrorum* var. *santolinifolia* Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV (1927) 693.—*A. gmelini* var. *biebersteiniana* Bess. and var. *legitima* Bess. op. cit. 26.—*A. gmelini* var. *turtschaninovianum* Bess. op. cit. 87; DC. Prodr. VI, 107.—*A. turtschaninoviana* Krasn. Spisok Rast. Vost. Tien Shan. (1887) 68.—*A. gmelini* Turcz. Fl. baic.-dahur. II (1845) 57.—**lc.**: Ldb. Ic. pl. Fl. Ross. V (1834) tab. 471; Gmel. Fl. sib. op. cit. tab. 56 f. 1.—**Exs.**: GRF Nos. 3278a, b, c.

466 Perennial. Semishrub, 12–45(80) cm high, very rarely 7–10 cm high (f. *pygmaea* (Kryl.) Krasch.), with thick woody root bearing perennial, woody, usually more or less short, branched, spreading, vegetative shoots covered with dark gray bark; fertile shoots numerous, erect, straight, ribbed, woody in lower part. Leaves punctate-alveolar or alveolate-rugose, dark green, glabrous or weakly pubescent above, grayish- or yellowish arachnoid-woolly beneath; lower leaves with pinnatisect auricles at base, usually 2–4 cm long and 1–2 cm wide; lamina ovate, twice or thrice pinnately cut, lobes approximate, terminal lobes numerous, small, linear or lanceolate, undivided or serrate-toothed, sub-obtuse; part of rachis between lobes also with similar lobes; middle and upper leaves smaller, sessile or short-petiolate, twice pinnately cut; upper bracteal leaves simple pinnate or entire, linear. Capitula subglobose, 3–5(6) mm in dia, sessile or short-pedunculate, mature capitula inclined or drooping, crowded on short, upright branches or on main axis of stem in narrowly racemose or paniculate inflorescence. Outer involucre bracts glabrous or pubescent, oblong-

lanceolate, herbaceous with narrow, uneven, scarious margin; inner bracts ovate, glabrous, with wide scarious margin. Receptacle plano convex, smooth. Peripheral florets pistillate, few (10–12), their corollas narrowly tubular, punctate-glandular, broadened toward base, stigma lobes linear, truncate, divergent; disk florets bisexual, numerous, usually 52–58, of which some undeveloped, corolla tubular-conical, glabrous, punctate-glandular, anthers linear, apical and basal appendages of anthers acute, stigma lobes linear, straight, divergent or slightly inclined. Flowering August.

Stony, clayey-rubby slopes of mountains, ascending to timber line.—*European part*: Volga-Kama (southern Urals); *Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, Dauria; *Soviet Central Asia*: Pamiro-Alai Region, Tien Shan, Dzhungaria-Tarbagatai. *General distribution*: Mongolia. Described from the Ona River. Type in Leningrad.

Economic Importance. According to the data of O.I. Prokhorova and I.M. Lebedev (1928), the yield of essential oil was about 1% in plants collected in the Altai; according to A.F. Gammerman and Shchupinskaya (1937)—up to 0.56%; and according to S.N. Kudryashev (1936)—0.1%. According to the studies of G.Z. Chistova (1935), the oil contains 16% phenols, 14% aldehydes, 19–26% cineole and 5.9% camphors. Besides, hydrocarbons and alcohols are also found. According to the data of M.M. Goryaev, G.K. Kruglykhina, M.G. Pugachev, and I.M. Shabanov (1953), the essential oil in plants collected from the Dzhungarian Alatau contains 30% carbonyl compounds, mainly as thujone, 13.2% free alcohols, and 19.24% bound esters. In the oil, thujyl alcohol is the main alcohol; also present are about 2.3% borneol and, possibly, phenyl alcohol. Besides, the oil contains about 1% cineole, 8% organic acids (among them the presence of the formic and isovaleric acids has been confirmed), 9% phenols (mainly t-cresol), terpenic hydrocarbons
467 and azulene-forming sesquiterpenes (their type not identified), aldehydes giving only a qualitative reaction (these could not be isolated); azulene forming sesquiterpenes on dehydrogenation produce azulenes of blue color. The oil might be a source of thujone and thujyl alcohol.

According to the data of Bankovsky (1941) and P.S. Massagetov (1947), small quantities of alkaloids are contained in the capitula and leaves; according to Pekhachek (1948), 100 g of the green herb contains 4–5 mg of vitamin C. Plants collected at anthesis contain 19.0% protein and very little cellulose (17.7%). Despite some beneficial fodder qualities mentioned in the literature, according to I.V. Larin (1956), this plant should be considered undesirable in pastures.

29. **A. freyniana** (Pamp.) Krasch. in Spisok Rast. Gerb. Fl. SSSR, XI (1949) 42.—*A. sacrorum* Ldb. var. *latiloba* Ldb. f. e. *freyniana* Pamp. in Nuov. Giorn. Bot. Ital. n. s. XXXIV (1927) 688.—*A. sacrorum*

var. *viridis* f. *minor* Freyn. in Oest. Bot. Zeitschr. XLV (1895) 345.—
Exs.: GRF No. 3277.

Perennial. Root woody, slender, bearing strongly reduced perennial, vegetative, woody, branched shoots covered with brownish-gray, peeling bark; fertile shoots 18–35(45) cm high, slender, virgate, erect, brownish-violet, glabrous below, weakly hairy above, usually densely leafy, simple or with short branches. Leaves dark green, punctate-alveolar, glabrous above, weakly hairy beneath; lower leaves petiolate, withering early; middle leaves short-petiolate, in part sessile, with pinnately cut auricles at base, 2–3 cm long and 0.7–1.5 cm wide, oblong-ovate or oblong-lanceolate, twice pinnately cut, their lobes oblong, approximate, divergent, pinnately divided, lobes numerous, short, narrowly lanceolate, acute, entire or with short acute teeth; upper leaves bracteate, smaller, sessile, simple pinnate, some simple, linear-lanceolate. Capitula globose, 2–3 mm in dia, on short peduncles, inclined or drooping, crowded on short, slender, slightly inclined branches, in narrowly paniculate or racemose-paniculate inflorescence. Outer involucre bracts glabrous or subglabrous, small, oblong, herbaceous, with narrowly scarious margin; inner bracts larger, oval, with narrow (linear) green midrib, remaining part wide, white-scarious. Peripheral florets pistillate, 6, their corollas narrowly tubular, gradually expanding toward base, glabrous, punctate glandular, anthers somewhat exerted from tube, linear; disk florets bisexual, usually 18, their corollas conical, punctate-glandular; anthers on short filaments, lanceolate, apical appendages of anthers acute, basal appendages shorter; stigma lobes linear, straight, divergent, short-ciliate.

468 Dry southern slopes of [mud] volcanic cones and hills, along edges of deciduous forests as well as in dry meadows, river valleys, in forest zone.—*Far East*: Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Mongolia, northern China. Described from Nercha River. Type in Florence.

Series 3. Latifoliae Poljak.—Rhizomatous herbaceous perennials; leaves pinnately cut, twice or almost thrice pinnately cut or divided, primary lobes lacking petiolule, less often with it, upward spreading.

30. *A. medioxima* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 405.—*A. latifolia* Maxim. Prim. Fl. Amur. (1859) 159 p. p.

Perennial. Rhizome long, creeping, bearing few vegetative, divergent, leafy shoots. Stem usually single, 70–120 cm high, erect, herbaceous, glabrous in basal part, dull violet, weakly hairy above, leafy. Leaves punctate-alveolar, green above, glabrous or subglabrous, somewhat pale beneath, scatteredly covered with forked hairs; lower

and middle cauline leaves petiolate, 6–8(12) cm long and 2–4 cm wide, their lamina elliptical or oblong-ovate, twice pinnately cut; lobes lanceolate, petiolate, divergent, deeply pinnately divided into lanceolate or linear-lanceolate, obtuse, entire lobules; often 4–10 mm long; upper leaves smaller, sessile, or short-petiolate, pinnate or bipinnate; uppermost bracteal leaves simple, narrowly lanceolate, inclined, slightly exceeding inflorescence. Capitula hemispherical, 4–6 mm in dia, on long peduncles, drooping, more or less remote, lower capitula on long branches, upper on short, upward-spreading branches and in part on stem axis, into narrowly lax racemose-paniculate inflorescence. Outer involucre bracts narrowly elliptical or oblong-lanceolate, hairy; inner bracts larger, oval, glabrous, or subglabrous, with wide scarious border, general receptacle smooth. Peripheral florets pistillate, 9, their corollas narrowly tubular, with 2, teeth, stigma lobes shorter than tube; disk florets bisexual, numerous (to 35), their corollas tubular-conical, with 5 teeth, glabrous or in upper part scatteredly hairy; anthers lanceolate, their apical and basal appendages acute, stigma lobes erect, linear, after anthesis inclined, short-ciliate. Achenes somewhat flattened, narrow, oblong, brown, to 1.2 mm long, membranous-ribbed. Flowering August. (Plate XXV, Fig. 2).

Forest zone, deciduous forests and in meadows.—*Far East*: Zeya-Bureya, Uda River Area, Ussuri, Sakhalin. *General distribution*: Northern China. Described from Amur. Type in Leningrad.

31. **A. tanacetifolia** L. Sp. pl. (1753) 843; Willd. Sp. pl. III, 3, 469 1825; Krascheninn. In Spisok Rast Gerb. Fl. SSSR, X, 77; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2806.—*A. laciniata* Willd. Sp. pl. III, 3 (1800) 1843.—*A. laciniata* α . *glabriuscula* Ldb. Fl. Alt. IV (1833) 75.—*A. krascheninnikoviana* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 41, pro parte.—*A. punctata* Bess. ibid., p. 43, pro parte.—*A. macrobotrys* Ldb. Fl. Alt. IV (1833) 73; DC. Prodr. VI, 111; Ldb. Fl. Ross. II, 582, pro parte; Kryl. Fl. Alt. III, 647; Rydb. North Am. Fl. 34, part 3 (1916) 264.—*lc.*: Gmel. Fl. sib. II, tab. 58.—*Exs.*: GRF No. 3156a, b, c.

Perennial. Rhizome long, creeping, nodulose, besides shoots bearing rosettes of basal leaves. Stem usually single, herbaceous, 45–90(110) cm high, glabrous in lower part, sparsely arachnoid-hairy above, weakly leafy. Leaves punctate-alveolar, weakly hairy above, with bifid forked hairs, more densely hairy beneath, petiolate, their lamina oblong-ovate, 4–8 cm long and 2–4 cm wide, twice-, in part almost thrice pinnately divided, lobes oblong-elliptical, upward-spreading or almost perpendicular to rachis, sometimes weakly arcuately recurved, more or less deeply pinnately divided, lobes linear-lanceolate, acute, undivided

or more or less deeply incised with sharp teeth; basal leaves larger, long-petiolate, upper cauline leaves sessile, less complexly incised, uppermost bracteal leaves undivided, lanceolate-linear, short, not exceeding inflorescence. Capitula globose, 4–5(6) mm in dia, drooping, in long racemes, aggregated into lax panicle, 20–40 cm long, with distant and strongly elongated lower branches. Outer involucre bracts elliptical, hairy, white-scarious along margin; inner bracts larger, oval, glabrous; with wide brownish-scarious margin. Peripheral florets pistillate, 11–12, their corollas narrowly tubular, with 2 teeth, punctate-glandular, stigma lobes exerted from tube, narrowly linear, straight, slightly recurved; disk florets bisexual, 16–24, their corollas conical, glabrous, anthers linear, apical and basal appendages of anthers acute, stigma lobes exerted from tube after anthesis, arcuately recurved, short-ciliate. Achenes to 1.5 mm long, ovoid-oblong, somewhat flattened, dark brown, filiformly ribbed, with round convex areola at apex, undulately bordered. Flowering August.

Open coniferous and deciduous forests, forest meadows, glades, sometimes on stony slopes.—*European part*: Dvina-Pechora (low-lying areas of northern Dvina), Volga-Kama (middle and southern Urals); *Eastern Siberia*: Yenisei, Angara-Sayans, Lena-Kolyma, Dauria; *Far East*: Zeya-Bureya, Uda River Area. *General distribution*: North America (Alaska). Described from Siberia. Type in London.

32. **A. maximovicziana** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1953) 403; Krascheninn. in Mat. po Istor. Fl. i Rast. SSSR, II (1946) 137.—*A. laciniata* var. *latifolia* f. *maximoviczii* Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXVI (1938) 470.—**Ac.**: Krascheninn. op. cit. 120.

470 Perennial. Plant wholly glabrous or weakly pubescent with bifid forked hairs. Rhizome long, rather thick, stems single or 2–3, herbaceous, straight, 90–125 cm high, up to 4.5 mm thick, weakly leafy. Basal leaves long-petiolate, including petiole 25–35 cm long, and 10–15 cm wide, their lamina ovate or roundish-ovate, pinnately divided to dissected, lobes oblong-elliptical or lanceolate, short-decurrent on stalks, more or less deeply divided, lobes lanceolate or deltoid, sharply serrate-toothed; lower and middle cauline leaves with shorter petiole, upper sessile, less compound, uppermost bracteal leaves undivided, linear-lanceolate. Capitula hemispherical, 4–6 mm in dia, divergent, approximate or somewhat remote on short or elongate branches adpressed to stem, in narrow, long, paniculate inflorescence. Involucres glabrous or subglabrous; outer involucre bracts oblong, herbaceous, narrowly scarious along margin; inner bracts larger, oblong, obtuse, with wide scarious border. Receptacle glabrous. Peripheral

florets pistillate, 12–24, narrowly tubular, with 2 teeth; stigma lobes exserted from tube, linear, truncate, somewhat recurved; disk florets bisexual, numerous (34–36), their corollas conical, glabrous; anthers lanceolate-linear, apical appendages of anthers acute, basal appendages short, roundish; stigma lobes linear, short, divergent after anthesis. Flowering August. (Plate XXV, Fig. 1).

Ravines, river valleys, and north slopes of [mud] volcanic cones, in open deciduous forests and meadows. —*Far East*: Zeya-Bureya, Uda River Area, Ussuri, Sakhalin. Described from Amur River. Type in Leningrad.

Note. Outside the USSR, it probably is found in northern China (Amur River basin).

33. **A. remotiloba** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 404; Krascheninn. in Mat. Ist. Fl. i Rast. SSSR, II, 125.—**lc.**: Krascheninn. *ibid.*, Plate 9.

Perennial. Plant wholly glabrous or with occasional appressed hairs. Rhizome slender, ascending. Stems single or 2–3, straight or weakly flexuous, 50–65 cm high, slender, ribbed, dull stramineous, almost simple, weakly leafy. Leaves alveolate-punctate-glandular, except upper—petiolate; basal and lower cauline leaves 10–18 cm long and 4–9 cm wide, their lamina ovate, twice pinnately cut, lobes 3–5 pairs, strongly remote, perpendicular to rachis or somewhat obliquely upright, pinnate, lobules remote, lanceolate-linear, short-acuminate, undivided, less often with occasional, short, lobate teeth, 5–15(20) mm long; middle cauline leaves short-petiolate, smaller; upper bracteal leaves undivided, linear. Capitula hemispherical, 5–7 mm in dia, on long peduncles, 471 drooping, remote, racemose inflorescence. Involucral bracts ovate-oblong, herbaceous, with brown scarious margin, inner bracts oval or almost round, with wide scarious margin. Receptacle convex, glabrous. Peripheral florets pistillate, 10; their corollas narrowly tubular, apically narrowed, punctate-glandular; stigma lobes narrowly linear, exserted from tube, recurved; disk florets bisexual, numerous (40–45), their corollas narrowly cup-shaped-conical, punctate-glandular, anthers linear-lanceolate, apical appendages of anthers acute, basal appendages short, roundish, stigma lobes linear, short-ciliate, recurved after anthesis. Achenes ribbed, brown, apically flat, lacking border. Flowering August.

Open deciduous forests, meadow-steppes.—*Eastern Siberia*: Lena-Kolyma, upper part of Aldan River basin. Endemic. Described from Yakutia, Alga River. Type in Leningrad.

34. **A. armeniaca** Lam. Encycl. meth. I (1783) 293; DC. Prodr. VI, 111; Ldb. Fl. Ross. II, 583; Boiss. Fl. or. III, 371; Fedtsch. Perech.

Rast. Turk. IV, 198; Grossh. Fl. Kavk. IV, 140; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, X, 80; Krascheninn. in Fl. Yugo-Vost. Evrop. SSSR, VI, 358; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2808; Poljak. in Majeovski, Fl. 587.—*A. canescens* Willd. Sp. pl. III (1800) 1843; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 44.—*A. macrobotrys* Ldb. Fl. Alt. (1833) 73.—*A. potentillaefolia* Fisch. ex Spreng. Syst. veg. III (1826) 494.—**lc.**: Rchb. Ic. ex. Cent. 1 (1823) 6.—**Exs.**: GRF Nos. 978, 3159.

Perennial. Rhizome long, creeping. Stem single, less often few, herbaceous, ribbed, 40–100 cm high, sparsely leafy, grayish above from fine appressed hairs. Leaves scatteredly hairy and grayish-green or green above, densely beneath, whitish from long, bifid, appressed, silky hairs; basal leaves usually withering before anthesis; lower cauline leaves long-petiolate, their lamina oblong-ovate, 5–10 cm long and 2.5–5.0 cm wide, twice pinnately cut; lobes oblong-elliptical, upward-spreading, deeply pinnately incised or divided, terminal lobes 3–10 mm long, 1–2 mm wide, lanceolate, with long almost awn-like acuminate apex, undivided or with few teeth; middle and upper leaves smaller, sessile, upper bracteal leaves undivided, lanceolate-linear, not exceeding inflorescence. Capitula globose, 3–4 mm in dia, on short peduncles, drooping or divergent, crowded on more or less short, weakly divergent branches, in narrow panicle. Involucral bracts weakly hairy; outer bracts almost oval, herbaceous, with narrowly scarious margin; inner roundish oval, obtuse, with wide scarious, slightly incised brownish margin. Peripheral florets pistillate, 10; their corollas narrowly tubular, with 2 teeth, punctate-glandular; stigma lobes exserted from tube, short, linear, truncate; disk florets bisexual, 22; their corollas conical, glabrous, 472 anthers included, on short filaments, linear, apical appendages of anthers acute, basal appendages short, obtusely acuminate, stigma lobes short, linear, straight, divergent, short-ciliate. Achenes to 3 mm long, oblong, somewhat flattened, apically convex, scarcely broadened. Flowering August.

Plains in meadow and feathergrass-herb steppes, occasionally in meadow depressions, less often on mountain slopes.—*European part*: Volga-Don, Lower Don, Middle Dnieper (Samara River), Trans-Volga, Volga-Kama; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Caucasus*: Eastern and Southern Transcaucasia, Dagestan. *General distribution*: Central Europe (Hungary, Transylvania), Armenia and Kurdistan. Described from Armenia. Type in Paris.

35. *A. latifolia* Lam. in Mém. Acad. Petersb. V (1815) 569; Ldb. Fl. Alt. IV, 70; DC. Prodr. VI, 110, pro parte; Ldb. Fl. Ross. II, 582; Maxim. Prim. Fl. Amur. (1859) 159; Kom. Fl. Manchzh. III, 667; Fedtsch. Perech. Rast. Turk. IV, 198; Krascheninn. in Fl. Yugo-Vost.

Evrop. Ch. SSSR, VI, 357; Kryl. Fl. Zap. Sib. XI, 2810; Poljak. in Majeovski, Fl. 587.—*A. punctata* β . *stricta* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 43.—*A. krascheninni-koviana* Bess. Ibid. p. 41, pro parte.—**lc.**: Ldb. Ic. pl. Ross. V, tab. 469.—**Exs.**: GRF No. 3282a, b.

Perennial. Plant entirely glabrous, less often weakly hairy (f. *pilosiuscula* Krasch.). Rhizome long, creeping, woody, apically ascending. Stem usually single, herbaceous, straight, ribbed, 15–80 cm high. Leaves alveolate-punctate-glandular; basal and lower cauline leaves long-petiolate, their lamina oblong-elliptical, 4–12 cm long, 2–7 cm wide, pinnately divided, lobes somewhat divergent above, at base decurrent on petiole, lanceolate or lanceolate-ovate, deeply incised but not up to midrib into teeth-like, 2–15 mm long and 1–3 mm wide lobules, with almost spine-like acuminate apex, entire, less often with 1–2 teeth; upper leaves simple pinnate, with serrate-toothed or entire secondary lobes; upper bracteal leaves linear-lanceolate, not exceeding inflorescence. Capitula pedunculate, subglobose, 3–5 mm in dia, approximate, drooping, on more or less short, erect branches, in narrowly paniculate inflorescence. Involucral bracts usually glabrous; outer bracts herbaceous, oval, with scarious incised margin; inner somewhat wider, membranous. Receptacle, hemispherical, glabrous. Peripheral florets pistillate, 9; their corollas narrowly tubular, with 2 teeth, punctate-glandular, stigma lobes exerted from tube, broadly linear, truncate, divergent or recurved; disk florets bisexual, rather numerous (up to 26), their corollas tubular, glabrous; anthers on short filaments, linear, apical appendages of anthers acute, basal appendages short, round; stigma lobes short, linear, apically short-ciliate, somewhat divergent after anthesis. Achenes 1.4 mm long, oblong-prismatic, somewhat flattened, with edges, brown, at apex with round convex areola, weakly bordered. Flowering July.

Steppes, less often alkaline meadows, in feather-grass-herb steppes, open birch forests, along edges of steppe pine woods, in forest zone in larch-pine forests, in south-facing meadows, sometimes rubbly and calcareous slopes — *European part*: Dvina-Pechora (Pinega River), Volga-Kama, Volga-Don, Trans-Volga; *Western Siberia*: Upper Tobol, Irtysh, Ob River Area (southern edge), Altai; *Eastern Siberia*: Angara-Sayans, Yenisei, Dauria; *Soviet Central Asia*: Aralo-Caspian Region. *General distribution*: Mongolia. Described from Siberia. Type in Leningrad.

Series 4. Laciniatae Kitamura in Acta Phyt. et Geobot. VIII (1939) 65.—Leaves twice or almost thrice pinnately cut, lobes petiolate, divergent almost at right angle to petiole.

36. **A. laciniata** Willd. Sp. pl. III, 3 (1800) 1843, excl. var.; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 40; DC. Prodr. VI, 110; Ldb. Fl.

Ross. II, 581; Turcz. Fl. baic.-dahur. II, 2; Maxim. in Bull. Acad. St. Pétersb. VIII, 530 p. p.; Kom. Fl. Manchzh. III, 665; Fedtsch. Perech. Rast. Turk. IV, 198; Pampan. in Nuov. Gior. Bot. Ital. n. s. XXXV, 671 p. p.; Hegi, III. Fl. VI, 2, 641; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1042; Kryl. Fl. Zap. Sib. XI, 2806.—*A. laciniata glabriuscula* Ldb. Fl. Alt. IV (1833) 75.—*A. laciniata* f. *paniculata* Kryl. Fl. alt. III (1904) 646.— **Ic.:** Gmel. Fl. sib. II, tab. 57.— **Exs.:** GRF Nos. 1127, 3157, 3158, 3283.

Perennial. Rhizome more or less thick, creeping or obliquely ascending. Stems few, herbaceous, erect, ribbed, 50–70(90) cm high, branched above, sparsely leafy, usually glabrous below, appressed-hairy above. Leaves green, alveolate-glandular, glabrous or scatteredly hairy above, densely hairy beneath, with distinct longitudinal veins and thick border along margin; lower and middle cauline leaves long-petiolate, their laminas almost as long as petiole, 3–12 cm long and 1.5–5.0(8.0) cm wide, oblong-elliptical, twice- or almost thrice- pinnately cut, lobes oblong or oblong-elliptical, sometimes slightly curved, divergent almost at right angle to rachis but lower lobes often even recurved; petioles at base somewhat thickened and decurrent, lobes also strongly inclined, oblong-lanceolate or lanceolate-linear, entire or with aristate-acuminate secondary lobes or teeth; upper leaves sessile, twice pinnately cut; bracteal leaves undivided except lower, linear, short. Capitula subglobose or hemispherical, 2–3 mm in dia, drooping approximate or somewhat remote on branches adpressed to stem, in narrowly paniculate inflorescence. Involucres glabrous or weakly hairy; 474 outer bracts oblong-ovate, greenish, with narrow scarious border, inner bracts oval, obtuse, with wide scarious border; common receptacle hemispherical, glabrous. Peripheral florets pistillate, 12, their corollas narrowly tubular, with 2 teeth, punctate-glandular, hairy; stigma lobes exserted from tube, linear, erect, truncate, deflected; disk florets bisexual, numerous (38–40); their corollas narrowly conical, weakly hairy below teeth; anthers lanceolate, apical and basal appendages of anthers short, acute; stigma lobes short, linear, divergent after anthesis. Achenes oblong-ovoid, somewhat flattened, finely sulcate, dark brown, apically with round areola, and edges. Flowering July to August.

Forest-steppe with bordering parts of forest and steppe zones, solonetzic meadows, meadow slopes, among scrub and open deciduous forests.—*European part:* Volga-Don (near Bobrov); *Western Siberia:* Upper Tobol, Irtysh, Altai, Ob River Area (southern part); *Eastern Siberia:* Yenisei, Angara-Sayans, Dauria, Lena-Kolyma; *Far East:* Zeya-Bureya, Ussuri. Kamchatka. *General distribution:* Central Europe, Mongolia, Northern China. Described from Siberia. Type in Berlin.

Note. Hooker (*Fl. Br. Ind.*, 1882) reports this species for western Tibet. Judging from his description, the Tibetan plant cannot be related to our species.

37. **A. phaeolepis** Krasch. in *Sistemat. Zam. Gerb. Tomsk. Univ.* 1-2 (1949); Krascheninn. in *Kryl. Fl. Zap. Sib.* XI, 2808.—*A. laciniata* α . *turczaninowiana* Bess. in *Bull. Soc. Nat. Mosc.* IX (1836) 48.—*A. laciniata* β . *turczaninowii* DC. *Prodr.* VI (1837) 111.—*A. laciniata* var. *glabriuscula* f. *marginata* Pamp. in *Nouv. Giron. Bot. Ital.* n. s. XXXIV (1927) 673, pro parte.—*A. laciniata* f. *racemosa* Kryl. and f. *tomentosa* Kryl. *Fl. Alt.* III (1904) 645, ex parte.

Perennial. Rhizome slender, creeping or obliquely ascending. Stem often single, less often 2-3, herbaceous, erect, ribbed, 5-40 cm high, scatteredly hairy in lower part or glabrous, densely hairy above with adpressed hairs, sparsely leafy, less often stems and leaves whitish-tomentose (var. *tomentosa* (Kryl.) Krasch.). Leaves alveolate-glandular, usually glabrous above, long-hairy beneath, with distinct longitudinal veins and thick border along margin; basal and lower cauline leaves petiolate, their lamina oblong-ovate or elliptical, shorter than petiole, 2-6 cm long and 1.5-3.0 cm wide, twice or almost thrice pinnately divided, lobes oblong-elliptical, divergent almost at right angle, rachis somewhat thickened, at base fused with equally thickened petiole, secondary lobes obliquely divergent, lanceolate, often undivided, less often divided into small toothed lobes and together apically cartilaginous, acuminate; upper leaves sessile, once or twice pinnately cut, uppermost leaves bracteal, short, linear, undivided with few teeth. Capitula few, hemispherical, 4-6 mm in dia, drooping, in simple long raceme or less often on short branches in narrowly racemose paniculate inflorescence. Involucres glabrous or subglabrous; outer involucre bracts oblong ovate, with narrow brown scarious border; inner bracts oval, obtuse with wide scarious border. Receptacle convex, hemispherical, glabrous. Peripheral florets pistillate, 14, narrowly tubular, with 2 teeth, punctate-glandular, stigma lobes exserted from tube, linear, truncate, divergent or recurved; disk florets bisexual, numerous (to 60), some sterile, corolla cup-shaped-conical, hairy and punctate-glandular; anthers lanceolate-linear, apical appendages of anthers acute, basal appendages shorter, subacute; style short; stigma lobes considerably shorter than tube, short-linear, divergent or slightly deflected, apically short-ciliate. Flowering July to August.

Mountain river valleys, on slopes, often stony places high in mountains, up to treeline or slightly above, on open southern slopes.—*Western Siberia*: Altai, Angara-Sayans. *General distribution*: Mongolia, Tibet.— Described from Altai. Type in Leningrad.



Plate XXII.

1 — *Artemisia stolonifera* Maxim., upper part of plant, lower cauline leaf, middle cauline leaf, peripheral pistillate floret, bisexual disk floret, style with stigma lobes, stamen, outer involucre bract, inner involucre bract, receptacle, achene; 2 — *A. rutifolia* Steph., habit, achene, bisexual disk floret.

Note. A doubtful species, which should be considered as a separate mountain race of *A. laciniata* Willd., distinguished by the less compound inflorescence (racemose-panicle) and more numerous bisexual florets.

38. ***A. laciniatiformis*** Kom. Fl. Kamch. III (1930) 153; Krascheninn. in Mat. po. Istor. Fl. i Rast. SSSR, II (1946) 136, 128.

Perennial. Root vertical, woody, with more or less elongate rhizome. Stems few, distant or approximate, 25–40 cm high or 7–10 cm (ssp. *taimyrensis* Krasch.), erect, sometimes arcuately bent downward, simple, leafy, more or less pubescent. Leaves on both sides with long occasional hairs, denser and more appressed beneath, punctate-glandular; lower cauline and basal leaves long-petiolate, including petioles to 7–8 cm long, and 2.0–3.5 cm wide, their lamina ovate, twice pinnately cut, rachis absolutely entire, pinnae oblong or obovate, pinnately cut, lobes lanceolate-linear, short-acuminate; upper cauline leaves smaller, subsessile, pinnately cut; uppermost leaves bracteal, undivided, linear-lanceolate. Capitula in simple raceme, hemispherical, 4–7 mm in dia, drooping, lower capitula remote, on long peduncles, upper crowded on short peduncles. Involucral bracts oval, with wide, brown, scarious, 478 unevenly incised margin; outer involucral bracts green along midrib, weakly hairy; inner bracts glabrous. Receptacle convex, hemispherical, glabrous. Disk florets bisexual, narrowly conical, with hairy or glabrous teeth. Achenes up to 1.2 mm long, oblong, indistinctly ribbed, apically with round areola bordered by upper margin of pericarp. Flowering July to August.

Floodplains of rivers and above, on high terraces of tundra, at southern border of arctic and forest-tundra zones.—*Arctic*: Arctic Siberia (Khatanga River, Taimyr Peninsula); *Eastern Siberia*: Lena-Kolyma (Kuma-Sur); *Far East*: Kamchatka. *General distribution*: North America (Yukon). Described from Kamchatka. Type in Leningrad.

Note. The plants of this species growing in Arctic Siberia are always distinguished from the Kamchatka plants by the hairy corolla and lower height; among them ssp. *taimyrensis* Krasch. deviates the most from *A. laciniatiformis* Kom.

Series 5. *lanceolatae* Poljak.—Leaves undivided, oblong-lanceolate.

39. ***A. macrorhiza*** Turcz. in Bull. Soc. Nat. Mosc. XIII (1840) 73; Ldb. Fl. Ross. II, 590.

Perennial. Plant green, weakly hairy. Rhizome creeping. Stem 25–35 cm high, herbaceous, curved, weakly leafy, branched, with slender elongated upright branches. Leaves undivided, sessile, 1.5–2.0 cm long,

oblong-lanceolate, glabrous; upper leaves smaller, lanceolate. Capitula on long, in part on short peduncles, in simple racemose inflorescence, subglobose, 4–6 mm wide, divergent or drooping. Involucral bracts round-elliptical, herbaceous, glabrous, with wide scarious border. Receptacle convex, hemispherical, glabrous. Florets glabrous, punctate-glandular; peripheral florets pistillate, 12, their corollas narrowly tubular, at base slightly broadened, membranous, with 2 teeth, stigma lobes exserted from tube, narrowly linear, almost straight, divergent; disk florets bisexual 35, fertile, in part sterile, their corollas tubular-conical, with 5 teeth, anthers on long filaments, linear, apical appendage of anthers acute, stigma lobes almost arcuate after flowering, short ciliate.

Gardens.—*Eastern Siberia*: Angara-Sayans (vicinity of Krasnoyarsk). Endemic? Described by N. Turczaninow from his own collections from Siberia. No more has been found anywhere so far. Type in Leningrad.

Note. It is well separated by the simple, oblong-lanceolate leaves.

Series 6. Norvegicae Rydb. North Am. Fl. 34, part 3 (1916) 261.—Capitula many-flowered, in simple racemose inflorescence.

- 479 40. *A. arctica* Less. in Linnaea, VI (1831) 213; DC. Prodr. VI, 119; Ldb. Fl. Ross. 591; Rydb. North Amer. Fl. 34, part 3, 263; Hult. Fl. Kamtsch. IV, 176, exl. syn.; Kom. Fl. Kamch. III, 150; Krascheninn. in Sov. Bot. No. 5, 7.—*A. arctica* ssp. *subarctica* (Krasch.) Hult. in Nytt. Mag. Bot. 3 (1954) 67.—*A. arctica* var. *ochotensis* (Bess.) Kom. op. cit. 151.—*A. arctica* var. *beringensis* Hult. op. cit. 67.—*A. longepedunculata* Bess. and *A. chamissoniana* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 177.—*A. montana* Schlecht. in herb. reg. berol. ex Ldb. Fl. Ross. II (1845) 591.—*A. norvegica* Spreng. Syst. veg. III (1826) 490, non Fries; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 533 p. p.; Kom. Fl. Manchzh. III, 668; Sugaw. Ill. Fl. Sachal. IV, 1813.—*A. norvegica pacifica* A. Gray Synops. Fl. North. Am. I (1884) 371.—*A. norvegica* Hall and Clements. The Phylogen. meth. (1923) 57, non Fries.—*A. subarctica* Krasch. in Bot. Mat. Akad. Nauk SSSR, IX (1946) 176.

Perennial. Root woody, thick, with very short, perennial, sterile shoots in upper part bearing leaf rosettes. Stems few or single, 25–40 cm high, erect, sometimes arcuately bent, glabrous or hairy, leafy. Leaves glabrous or hairy; basal leaves and leaves of sterile shoots long-petiolate, most often 5–8 cm long and 2–3(4) cm wide, twice pinnately cut lobes 5–7, remote, terminal lobe 3–7 mm long and 1.5–3.0 mm wide, linear-lanceolate more or less acute, simple, or with

small acute teeth; middle cauline leaves sessile or subsessile, pinnately cut, uppermost leaves bracteal, simple, narrowly linear. Capitula in simple long (up to 10–17 cm long) raceme, hemispherical, 5–8 mm in dia, divergent or drooping, remote, lower capitula on long (to 3–5 cm) peduncles, upper capitula on shorter peduncles. Involucral bracts lanceolate-ovate or elliptical, with dark brown scarious margin. Receptacle convex, hemispherical, glabrous. Peripheral florets pistillate, 12, fertile, their corollas tubular, membranous, hairy, stigma lobes linear, obtuse, divergent after anthesis; disk florets bisexual, numerous (50–70), fertile, in part immature, their corollas narrowly conical, yellow, with dense, long, straight white hairs; anthers on short filaments, broadly linear, acute, stigma lobes slightly curved after flowering, divergent, at apex ciliate. Achenes to 2.5 mm long, ovoid-oblong, angular; pappus lacking.

Mountain, subarctic, partly arctic, and maritime meadows.—*Arctic*: Arctic Siberia; *Eastern Siberia*: Lena-Kolyma; *Far East*: Kamchatka, Okhotsk, Sakhalin (Kuril Islands). *General distribution*: North America. Described from Aleutian Islands.

Note. *A. arctica* ssp. *subarctica* (Krasch.) Hult. is distinguished by the fewer lobes of the lower leaves (usually 5 and not 7); var. *ochotensis* Bess. is distinguished by the wider pinnules of the leaves and the large sessile capitula.

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41. ***A. punctigera*** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 408.—*A. norvegica* auct. non Fries: Sugaw, Ill. Fl. Saghal. (1940) 1813.

Perennial. Root rather thick, woody, with perennial woody, short, sterile shoots covered with remains of petioles, bearing rosettes of leaves; fertile shoots usually 2–3, erect, sometimes arcuately bent, 20–40 cm high angular-sulcate, smooth, sparsely leafy, more or less simple. Leaves glabrous or usually hairy, on both sides punctate-alveolar; basal leaves and leaves of sterile shoots long-petiolate, usually 7–9 cm long and 2–3 cm wide, twice pinnately cut, terminal lobes 4–8 mm long and 1.0–2.5 mm wide, lanceolate-linear, short-acuminate; middle cauline leaves sessile or short-petiolate, pinnately cut; upper leaves bracteal, linear-lanceolate, undivided or with 2–4 teeth at base. Capitula in long racemose inflorescence, hemispherical, 5–7 mm in dia; lower capitula on long peduncles, remote, upper on short peduncles, approximate. Involucral bracts oval, smooth, punctate-glandular, light brown, with wide scarious border, dark brown. Receptacle convex, glabrous. Peripheral pistillate florets 12, their corollas narrowly tubular, punctate-glandular, stigma lobes narrowly linear, subobtusely, somewhat divergent after anthesis; disk florets bisexual, numerous (to 75), their

corolla conical, narrowly cup-shaped in upper part, with recurved teeth, yellow, punctate-glandular, anthers on long filaments, lanceolate, acute, stigma lobes linear, straight, after anthesis divergent, apically densely ciliate. Achenes small, oblong-ovoid, angular-sulcate, brown, apically with scarcely attenuate upper margin; pappus lacking. Flowering August.

Sand dunes, banks, rubbly slopes, in dry-valley larch and open spruce forests.—*Far East*: Sakhalin Island. Endemic. Type in Leningrad.

42. **A. norvegica** Fries. Novit. Fl. Suec. ed. I (1817) 56, tab. 3; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 76; DC. Prodr. VI, 119; Krascheninn. in Sov. Bot. No. 5, 11; Kryl. Fl. Zap. Sib. XI, 2819; Hult. in Nytt. Mag. Bot. 3, 65.—*A. norvegica* var. *walensis* Rupr. in Beitr. z. Pflanzenk. Russ. Reich. 8 (1850) 64 and Fl. bor.-ural. (1856) 37; Hult. op. cit. p. 64.—*A. norvegica* var. *villosula* Trautv. ex Korsh. in Mém. Acad. Sc. Pétersb. VIII, VII, 1 (1898) 221; Hult. op. cit. p. 65.—*A. rupestris* O.F. Muell. in Fl. Danica fasc. decimus. quart. tab. DCCCI, ed. 4, (1780) non L.—*A. ruprechtii* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 409.— *Ic.*: Rchb. Pl. crit. I (1823) tab. 89.

Perennial. Rhizome thick, creeping or ascending, often branched in upper part, bearing rosettes of leaves and one or many, erect or
481 ascending (only at base) stems, 13–30 cm high, more or less densely covered with long entangled hairs, sometimes subglabrous. Leaves hairy; basal leaves with long flattened petioles, almost 2 times as long as lamina or almost equal to it, twice pinnately cut, lobes 2–3 pairs, divided into 3 or 4 linear or linear-lanceolate secondary lobes, 5–15 mm long and 1–2 mm wide; cauline leaves smaller, short-petiolate, at base usually with small lobes; uppermost leaves sessile, pinnate, with undivided linear lobes. Capitula 3–7, drooping, 10–12 mm in dia, hemispherical, one each on 3–12 cm long peduncles, adpressed to stem, in simple racemose inflorescence. Involucre cup-shaped, involucre bracts oval or oblong-ovate, green and hairy in middle, with brownish-black scarious border. Receptacle glabrous. Peripheral florets pistillate, fertile, 8–12, their corollas narrowly tubular, with 3 teeth, densely hairy, stigma lobes narrowly linear, glabrous, after anthesis more or less divergent; disk florets bisexual, numerous (120–156), fertile, in part immature, their corollas narrowly conical, to 4 mm long, with 5 teeth, yellow, densely hairy or glabrous, punctate-glandular (var. *uralensis* Rupr.), anthers on short filaments, linear, acute, connate into a tube [syngenesious], stigma lobes narrowly linear, after anthesis exerted from corolla tube, arcuate, apically ciliate. Achenes elongated, prismatic, brown; pappus lacking.

Stony slopes and outwash gravel in alpine and arctic-alpine zone.—
Arctic: Arctic Europe (northern Urals), Arctic Siberia (Kara River basin, Kara tundra). *General distribution*: Scandinavia (Norway). Described from Kongevold in Norway. Type in Sweden.

Series 7. Globulares Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 426.—Corolla of all florets alike with 5 teeth, violet; capitula in compact capitate inflorescence.

43. *A. globularia* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 64; DC. Prodr. VI, 116; Ldb. Fl. Ross. II, 588; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 534; Rydb. North Am. Fl. 4, part 3, 261.—*A. norvegica globularia* Hall and Clements. Amer. Artem. (1923) 58.—*Aiania globularia* (Bess.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 426.

482 Perennial. Root woody, vertical with very short, crowded, perennial, sterile shoots bearing leaf rosette, forming small tussocks. Stems single or 2–3, erect or somewhat inclined, 7–13(17) cm high, simple, sulcate, with 1–2–3 leaves excluding basal, woolly in upper part, glabrous below or weakly hairy. Leaves grayish from dense, long, straight, appressed hairs; basal leaves and leaves of sterile shoots long-petiolate, 2–4 cm long and 0.6–1.5 cm wide, usually ternate, lobes undivided or often divided, with 2–3 lanceolate-linear, 4–10 mm long and 0.5–1.5 mm wide, short-acuminate lobules; cauline leaves considerably shorter, undivided, linear-lanceolate or apically short-ternate. Capitula at apices of stems, subsessile, in compact capitate inflorescence; less often lower capitula somewhat remote on up to 2.0–2.5 cm long peduncles. Involucral bracts oblong or oval, more or less densely hairy, with wide, scarious, brown, unevenly incised margin. All florets with wide, cup-shaped-conical, dark purple, punctate-glandular corolla, with rather large, deltoid recurved teeth; peripheral florets pistillate, 9; disk florets bisexual, to 20; anthers broadly lanceolate, apical appendages of anthers broadly obtuse, basal appendages smaller, subacute, stigma lobes of all florets identical, short, linear, apically ciliate, recurved after anthesis. Achenes oblong, slightly narrowed toward base, tetraquetrous, with weakly bordered flattened apex; pappus lacking. Flowering August.

Stony seacoasts, rocks, islands, in arctic and subarctic zones.—
Far East: Chukotka, Anadyr, Kamchatka. *General distribution*: North America (Alaska). Described from Eschscholz's collections from Gulf of Saint Lawrence. Type in Leningrad.

Series 8. Glomeratae Rydb. North Am. Fl. 34, part 3 (1916) 260.—Florets glabrous or weakly hairy; inflorescence usually compact or lax, corymbose, capitate or racemose.

44. **A. glomerata** Ldb. in Mém. Acad. St. Pétersb. V (1812) 564; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 63; α . Prodr. VI, 116; Ldb. Fl. Ross. II, 588; Maxim. in Bull. Acad. Sc. Petersb. VIII (1872) 532 p. p.; Rydb. North Am. Fl. 34, part 3, 260, exl. syn.; Hult. Fl. Kamtsch. IV, 182; Kom. Fl. Kamch. III, 147 p. p.—*A. glomerata* ssp. *curiliensis* (Spreng.) Krasch. in Istor. Fl. i Rast. III (1958) 105.—*A. curiliensis* Spreng. Syst. veg. III (1826) 489.—*A. corymbosa* Fisch. and *A. steveniana* ex Bess. op. cit. p. 74.—*A. norvegica glomerata* Hall and Clements, North Amer. Artem. (1923) 61.—*Ajania glomerata* (Ldb.) P. Pol. comb. nov. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 426.

Perennial. Tap root woody, with numerous, perennial, woody, sterile, prostrate or ascending, short shoots in upper part with leaf rosette, thus forming rather compact tussocks. Fertile stems numerous or few, (6)10–15(25) cm high, straight or flexuous, in lower part arcuate, ribbed, simple, weakly leafy, more or less densely hairy above. Leaves
483 whitish, appressed-hairy; basal leaves and leaves of sterile shoots petiolate, 1.5–2.0 cm long and 0.7–1.5 cm wide, thrice pinnately parted, lobes pinnately parted, terminal lobe lanceolate, scarcely acute, 2–6 mm long; cauline leaves few, sometimes 2–3, with 3–6 lobes or undivided, narrowly lanceolate. Capitula broadly campanulate, to 4 mm wide, at stem apex in more or less compact corymbose-capitate inflorescence; sometimes lower capitula somewhat remote on long peduncles (ssp. *kuriliensis* (Spreng.) Krasch.). Involucral bracts oblong-elliptical, densely hairy, with involute scarious margin. Receptacle narrow, glabrous. All florets fertile; peripheral pistillate (to 7), their corolla tubular, with 3–4 teeth, glabrous; disk florets bisexual, usually 15, their corolla cup-shaped, conical, with 5 teeth, anthers on rather long filaments, lanceolate-linear, apical appendages of anthers acute, basal appendages shorter, round; stigma lobes of all florets narrowly linear, short-ciliate, recurved after anthesis. Achenes to 2 mm long, narrowly oblong, indistinctly tetraquetrous, with flat scarcely bordered upper margin.

Seacoasts, in tundra, arctic zone and mountains up to the alpine zone.—*Arctic*: Arctic Siberia; *Far East*: Chukotka, Anadyr, Kamchatka, Okhotsk. *General distribution*: North America (Alaska). Type in Leningrad.

45. **A. furcata** MB. Fl. taur.-cauc. III (1819) 567; Krascheninn. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX, 179.—*A. trifurcata* Steph. in Spreng. Syst. veg. III (1826) 488; Bess. in Nouv. Mém. Nat. Mosc. III, 73; DC. Prodr. VI, 119; Ldb. Fl. Ross. II, 591; Maxim. in Bull. Acad. Sc. Pétersb. VIII (1872) 533; Kom. Fl. Kamch. III, 149;

Hult. Fl. Kamtsch. IV, 187.—*A. heterophylla* Bess. op. cit. 74; Ldb. op. cit. 591; Rydb. North Am. Fl. 34, part 3, 262, excl. syn.; Sugawara, Ill. Fl. of. Sagh. IV, 1831.—*Ajanía furcata* (MB.) P. Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 428.—**lc.**: Sugaw. op. cit. tab. 839.

Perennial. Root woody, vertical, with number of very short, woody, crowded, sterile shoots in upper part with leaf rosettes, forming a small tussocks. Fertile stem single or two or three, erect or slightly bent, simple, weakly leafy, dull violet, 15–25 cm high, densely lanate in upper part, glabrous below. Leaves weakly hairy, sometimes subglabrous, with erect, rather long, appressed or somewhat divergent hairs; basal leaves and leaves of sterile shoots long-petiolate, 3–4 cm long and to 1.5 cm wide, ternate or palmately divided into 7–12 mm long and to 1 mm wide, short-acuminate lobes; cauline leaves undivided, linear, less often ternate. Capitula subglobose, 4–6 mm in dia, in simple raceme, crowded or almost capitately clustered, upper capitula subsessile, lower on 5–8 mm long peduncles. Involucral bracts broadly ovate, densely hairy, with brownish scarious margin. All florets with colored corolla; peripheral pistillate florets 7, tubular, with 3–4 teeth, punctate-glandular, glabrous; disk florets bisexual, 15–26, their corollas cup-shaped-conical, with 5 teeth; anthers lanceolate, apical appendages of anthers obtuse, basal appendages short, round; stigma lobes of all florets identical, linear, apically short-ciliate, arcuately curved after flowering. Achenes oblong, ribbed, with flat-bordered apex; pappus lacking. Flowering August.

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Seacoasts, in river valleys on well-drained terraces, in arctic zone and alpine tundra belt above timberline—*Arctic*: Arctic Siberia (Taimyr), Chukotka, Anadyr; *Eastern Siberia*: Dauria (Khamer-Daban), Lena-Kolyma (low-lying areas of Lena and Oleneka rivers); *Far East*: Zeya-Bureya (mountains), Okhotsk, Kamchatka. *General distribution*: North America (Alaska).

46. **A. insulana** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 177.—*A. trifurcata* auct. non Steph.: Fedtsch. Fl. des îles du Commaheur (1906).—*A. norvegica* ssp. *heterophylla* Hall and Clements. North Amer. Spec. of Artemisia (1923), quoad plant. ins. Command.—*Ajanía insulana* (Krasch.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 428.

Root thick, woody, with short perennial, woody, thick, sterile shoots in upper part, bearing leaf rosette, rather densely crowded forming small tussock. Fertile stems few, sometimes single, divergent, straight, sometimes slightly bent, 10–20 cm high, ribbed, arachnoid-hairy, weakly leafy. Leaves very densely sericeous; basal leaves and leaves of sterile

shoots petiolate, 2–5 cm long and 1.5–3.0 cm wide, twice ternately divided, lobes ternate, approximate, terminal lobe 5–15 mm long and 1.5–2.0 mm wide, lanceolate, short-acuminate; cauline leaves ternate or pinnately parted, or even simple, linear-lanceolate. Capitula in simple, 5–10 cm long raceme, lower capitula on more or less long peduncles, remote, drooping, upper capitately clustered, hemispherical, 5–8 mm in dia. Involucral bracts oval, densely hairy, with blackish scarious margin. Receptacle glabrous. All florets fertile, purple-violet; peripheral florets pistillate, 8, tubular, with 3–4–5 teeth; disk florets bisexual, 12, their corollas conical, with 5 teeth, hairy, anthers on short filaments, lanceolate, apical appendage of anthers obtuse, basal appendages short, sub-acute; stigma lobes of all florets identical, linear, apically ciliate. Flowering August.

Stony slopes of [mud] volcanic cones and outwash gravel.—*Far East*: Commander Islands. Endemic. Described from Mednyi Island. Type in Leningrad.

Series 9. Senjavinenses Poljak.—Leaves ternate; capitula in compact capitate or oblong[cylindrical] inflorescence.

- 485 47. *A. senjavinensis* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1832) 65, err. “semavinensis;” DC. Prodr. VI, 116; Ldb. Fl. Ross. II, 588; A. Gray Synopt. Fl. North Am. Fl. 1, part 2, 370; Rydb. North Am. Fl. 34, part 3, 260.—*Ajania senjavinensis* (Bess.) Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 428.

Perennial. Whole plant whitish from dense, long divergent hairs. Tap root woody, with very short, sterile, woody shoots in upper part, densely covered with small overlapping leaves, hence assuming habit of hemispherical or oblong “heads,” 0.3–1.5 cm long and 0.5–1.3 cm wide, “heads” in turn overlapping to form small compact tussock. Stems few, 3–6 cm high, straight, simple, leafy. Leaves of sterile shoots 4–7 mm long, in upper half ternate, lobes lanceolate, acute; cauline leaves usually 2–5, with 3–5 lanceolate lobes. Capitula on short peduncles, campanulate, 4 mm long and 3.5 mm wide, in compact, terminal, capitate, globose or oblong inflorescence, 1–2 cm long and 1.0–1.5 cm wide. Involucral bracts semitransparent, membranous, on margin unevenly incised and with acute teeth; outer bracts broadly elliptical, densely hairy; inner bracts oblanceolate, glabrous, with occasional hairs only on margin. Receptacle convex, conical, glabrous. All florets fertile; peripheral florets pistillate (5); their corollas tubular with 3 teeth, glabrous, yellow; disk florets bisexual, rather numerous, their corollas cup-shaped-conical, with 5 teeth, anthers on rather long filaments, lanceolate, apical appendages of anthers obtuse, basal appendage

shorter, acute; stigma lobes of pistillate and bisexual florets identical, narrowly linear, apically short-ciliate, usually arcuately bent after anthesis. Achenes about 2 mm long, linear-oblong, with 4 indistinct angles, brown, with flat apex, weakly bordered. Flowering August.

Arctic seacoasts.—*Far East*: Chukotka. *General distribution*: North America (western Alaska). Described from Bering Sea from Mertens' collections. Type in Leningrad.

48. **A. leontopodioides** Fisch. ex Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1832) 63; DC. Prodr. VI, 116; Ldb. Fl. Ross. II, 587.—*A. glomerata* Rydb. North Am. Fl. 34, part 3 (1916) 260 p. p.—*Ajanía leontopodioides* (Bess.) in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 428.

Perennial. Whole plant silky from long, straight, appressed, whitish hairs. Root woody, with numerous short, ascending, woody leafy shoots in upper part forming more or less a compact tussocks. Stems rather numerous or few, (6)10–15(20) cm high, arcuate or flexuous, simple, weakly leafy. Basal leaves and leaves of sterile shoots petiolate, to 486 2.0–2.5 cm long, ternate, lobes usually ternate, their terminal secondary lobes linear-lanceolate, acute, 2–5 mm long; cauline leaves smaller, mostly simple, ternate, uppermost sometimes simple, narrowly lanceolate. Capitula numerous, on short peduncles, campanulate or hemispherical, 3–4 mm in dia, in compact globose, corymbose-capitate inflorescence. Involucral bracts membranous, densely hairy; outer bracts oval, inner oblong-lanceolate. Receptacle small, glabrous, peripheral florets pistillate, their corollas tubular, with 3–4 teeth; disk florets bisexual, their corollas broadly cup-shaped conical, deeply notched-toothed, densely covered with long, straight white, divergent hairs. Achenes oblong-linear, weakly ribbed, with long, white divergent hairs.

Stony seacoasts.—*Far East*: Kamchatka, Sakhalin (Kuril Islands). *General distribution*: Reported for North America (Alaska). Type in Leningrad.

Series 10. Angaro-ochotenses Krasch. ex Poljak.—Perennials, densely caespitose; leaves twice pinnately cut or twice ternate.

49. **A. lagopus** Fisch. ex Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1832) 69; DC. Prodr. VI, 117; Ldb. Fl. Ross. II, 589.—Maxim. in Bull. Acad. Sc. Pétersb. VIII, 34.—*A. meyeriana* Bess. in Linnaea, XV (1841) 96.

Perennial. Whole plant silky-woolly from whitish (ochraceous when dry), long, straight or flexuous, appressed and divergent hairs. Root woody, with perennial woody, procumbent or ascending sterile shoots,

with young leafy shoots forming compact tussocks. Fertile stems few, sometimes single, (7)12–20(25) cm high, straight, at base arcuately curved, cylindrical or weakly ribbed, simple, leafy. Leaves of sterile shoots 2–3 cm long, long-petiolate, petioles gradually thickening toward base, lamina round, 0.7–1.2 cm wide, twice pinnately cut, with strongly approximate lobes, terminal lobes lanceolate-linear, acute, 1.5–3.0 mm long; lower and middle cauline leaves short-petiolate, upper leaves sessile, simple pinnate. Capitula sub-globose, 4–5 mm long and 3–4 mm in dia, subsessile or on short peduncles, clustered in terminal, compact, linear-oblong, 3–5 cm long, spicate-racemose inflorescence, but sometimes lower capitula somewhat remote, and then inflorescence elongated (ssp. *abbreviata* Krasch.), up to 8–12 cm long. Receptacle convex, scatteredly hairy. Involucral bracts lanceolate, acute; outer bracts woolly, inner ones shorter than outer bracts, weakly hairy, with
 487 wide scarious border. Peripheral florets pistillate, with narrowly tubular, punctate-glandular, glabrous corolla. Disk florets bisexual, their corollas conical, with hairs on teeth. Achenes narrowly oblong, somewhat narrowed toward base, ribbed. Flowering August.

Sandy seacoasts and rocks.—*Far East*: Okhotsk. Endemic. Described from Okhotsk coast from Krause's collections. Type in Leningrad.

50. *A. triniana* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1832) 67; DC. Prodr. VI, 117; Ldb. Fl. Ross. II, 589; Krascheninn. in Sov. Bot. No. 5 (1943) 14.

Perennial. Whole plant whitish-tomentose from long, usually appressed hairs. Root woody, vertical, with rather numerous, branched, perennial, prostrate shoots densely caespitose, with short, young, densely leafy shoots. Fertile stems rather numerous, sometimes few, including inflorescence 3–5–10 cm high, usually densely leafy, simple. Leaves of sterile shoots and lower cauline leaves petiolate, 1.0–1.4(1.8) cm long, petioles thickening toward base, lamina almost round, 0.6–1.0 cm wide, twice ternate or twice ternate-palmately divided, lobes often 3, short-petiolate, ternately palmate or pinnate, secondary lobes 1–3 mm long, lanceolate or linear-lanceolate, subacute; middle and upper cauline leaves sub-sessile or sessile, mostly pinnately cut. Capitula hemispherical, 4–5 mm long and 3.5–4.5 mm in dia, on very short peduncles, clustered in compact, terminal, ovate or oblong-ovate, 1–2 cm long inflorescence. Outer involucral bracts oblong-lanceolate, with narrowly herbaceous midrib and scarious margin, brownish, usually densely covered with long, white, semi-squarrose hairs; inner bracts oblong, glabrous, hairy only along margin. Receptacle convex,

glabrous. Peripheral florets pistillate, 7, their corollas narrowly cup-shaped-conical, with 4 teeth, punctate-glandular, glabrous; disk florets bisexual, 11–12, cup-shaped conical; anthers on long filaments, lanceolate-linear, apical appendages of anthers acute-angled, basal appendages shorter, acute; stigma lobes of all florets linear, apically short-ciliate, straight, after anthesis recurved.

Sandy coasts, well-drained high terraces of rivers in arctic zone.—*Arctic*: Arctic Siberia (low-lying areas of the Lena, Olenyok and Khatanga rivers. Endemic. Type in Leningrad.

Series 11. *Paniculigeræ* Poljak.—*Artemisia* subsect. *Glochistigma* Kitamura in Acta Phyt. et Geobot. VIII (1939) 63.—Capitula in racemose-paniculate inflorescence; stigma lobes with narrowly linear apical appendage.

488 51. **A. *keiskeana*** Miquel, in Ann. Mus. Lugd.-Bat. II (1866) 176; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 534; Kom. Fl. Manchzh. III, 669; Nakai Fl. Korean. II, 29; Nakai in Bot. Mag. Tokyo, XXVI, 101, incl. f. *typica*, *hirtella* and *hypoleuca*: Pampan. in Nouv. Giorn. Bot. Ital., n.s. XXXIV, 670; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1042; Hara, Enum. Spermatoph. Japonic. II, 119.—*A. vulgaris stolonifera* lusus b. *glabrescens* Rgl. Fl. Ussur. (1862) 95.—*A. japonica* F. Schmidt. Fl. Sachal. (1868) 149, planta Albrechti e Hokadate, non Thbg.

Perennial. Rhizome strong, branched, with underground or aerial creeping shoots. Stems erect or bent, 20–50 cm high, uniformly leafy, with divergent hairs, in part subglabrous, with short branches in upper part or almost simple. Leaves sometimes with small acute auricles, green above, usually glabrous, pale green beneath, weakly hairy; lower cauline leaves and leaves of sterile shoots 5–6(8) cm long, usually short-petiolate, cuneate or ovate, broadly toothed with 7 teeth, cuspidate; middle cauline leaves always sessile, smaller, with 3–5 teeth; uppermost leaves broadly lanceolate, entire or with a pair of very short, acute teeth. Capitula on long peduncles, bent or drooping, subglobose, 2.5–3.0 mm long, in short, secund, lax racemes forming narrowly racemose-paniculate inflorescence. Involucral bracts glabrous, convex, green along midrib, with wide scarious margin; outer bracts oval, inner larger, with attenuate obtuse apex. Peripheral florets pistillate, 7, their corollas narrowly tubular, punctate-glandular, pilose; stigma lobes short, broadly linear, scarcely reduced; disk florets 14, bisexual, their corollas conical, punctate-glandular, anthers linear, apical appendages of anthers short, obtuse, basal appendages smaller, subobtuse; stigma lobes apically broadened, bearing quite long, narrowly linear appendage. Achenes

plano-convex, ovate, to 1.5 mm long, dark brown, glabrous, lacking pappus. Flowering August.

Forest zone, on slopes of [mud] volcanic cones and ridges, deciduous and deciduous-open coniferous forests, partly on rock outcrops.—*Far East*: Zeya-Bureya, Ussuri (southern Sikhote-Alin). *General distribution*: Northern China, Korea, Japan. Described from Japan.

Series 12. Annuae Rydb. in North Amer. Fl. 34, part 3 (1916) 259.—Plants glabrous or scatteredly short hairy; leaves twice or thrice pinnately divided into oblong-lanceolate, toothed lobes with subacute teeth, less often lobes entire; receptacle glabrous.

52. *A. tournefortiana* Rchb. Icon. ex. Cent. 1 (1823) 6, tab. 5; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 82; DC. Prodr. VI, 119; Ldb. Fl. Ross. II, 592; Boiss. Fl. or. III, 372; Hook. Fl. Brit. Ind. III, 324; Fedtsch. Perech. Rast. Turk. IV, 200; Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV (1927) 705; Grossh. Fl. Kavk. IV, 138.—Pampan. in Lavori Inst. bot. Univ. Cagl. XL, 570.—*A. annua* Trautv. Enum. pl. Song. (1868) No. 616; non L.

- 489 Annual. Plants glabrous or with scattered, bifid, forked, appressed hairs. Stem 120–190 cm high and up to 7–14 mm thick, brownish-violet, finely ribbed, almost simple, leafy. Leaves (except bracteal leaves) petiolate; lower leaves 7–16 cm long and 4–6 cm wide, lamina ovate-oblong, twice pinnately cut, their lobes short-petiolate, oblong-lanceolate, deeply pinnately divided or almost divided into lanceolate, subacute, toothed lobules; middle and upper cauline leaves shorter, less incised, bracteal leaves simple pinnate, serrate dentate or even sometimes entire, linear-lanceolate. Capitula numerous, broadly ovate or subglobose, to 2 mm wide, upright, densely clustered on short or long, weakly divergent shoots forming usually narrow, rather compact paniculate inflorescence. Involucral bracts with herbaceous midrib, glabrous, broadly scarious; outer bracts oval, inner bracts lanceolate or elliptical. Receptacle convex, glabrous, tuberculate-glandular, stigma lobes exserted, narrowly linear, straight or slightly recurved. Disk florets bisexual 10, their corollas conical, purple-pink, in lower part punctate-glandular; anthers narrowly linear, apical appendages of anthers elongated, cuneate, basal appendages short, acute, their stigma lobes short, not exserted from tube, linear. Achenes to 1 mm long, oblong-narrowly ovoid, somewhat flattened, finely sulcate, apically with flat, round areole. Flowering August.

Weed, on riverbanks, irrigation canals, irrigated lands in desert and steppe zones, in mountains, along valleys and slopes.—*Caucasus*: Southern Transcaucasia; *Soviet Central Asia*: Lake Balkhash Region,

Dzhungaria-Tarbagatai, Tien Shan, Syr-Darya, Pamiro-Alai, Amu-Darya, Kara-Kum, (Amu-Darya delta), mountainous Turkmenia. *General distribution*: Armenia and Kurdistan, Iran, Indo-Himalayas, Dzhungaria-Kashgaria, Tibet. Described from "Orient." Type in Berlin.

Economic Importance. S.N. Kudryashev (1934) reports that the aerial part of the plant contains about 0.01% essential oil; according to the data of Vyshensky (1938)—0.14–0.34%. According to the data of M.I. Goryaev et al. (1954), from plants collected 15 km from the village of Lugovaya (Dzhambul Region), the yield of essential oil was 0.053% in absolutely dry matter, but 0.035% on an air-dry basis. The oil is a viscous liquid, yellow-orange in color, with a pleasant smell. $n_D^{20} = 1.5080$.

490 53. **A. annua** L. Sp. pl. (1753) 847; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 81; DC. Prodr. VI, 119; Ldb. Fl. Ross. II, 592; Boiss. Fl. or. III, 371; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 529; Hook. Fl. Br. Ind. III, 323; Kom. in Fl. Manchzh. III, 659; Nakai, Fl. Korean. II, 30; Fedtsch. Perech. Rast. Turk. IV, 200; Rydb. North Am. Fl. 34, part 3, 259; Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV, 637; Hall and Clem. Artem. (1923) 102; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1036; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 357; Grossh. Fl. Kavk. IV, 138; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2816; Poljak. in Majeviski. Fl. 586.—*A. chamomilla* Winkl. in Tr. Peterb. Bot. Sada, X, 87; Fedtsch. loc. cit.—**lc.**: Amm. Stirp. rar. t, 193, f. 23; Gmel. Fl. sib. II, tab. 125.—**Exs.**: GRF No. 3152.

Annual. Plant aromatic, green, glabrous or with scattered, small, approximate hairs. Stems erect, ribbed, brownish or violet-brown, 30–100 cm high. Leaves alveolate-punctate-glandular; lower leaves petiolate, 3–5 cm long and 2–4 cm wide, ovate, thrice pinnately cut, their lobules oblong-lanceolate, short-acuminate, entire or with 1–2 teeth, 1–2 mm long and 0.5 mm wide; middle and cauline leaves twice pinnately cut; upper leaves sessile smaller and less compound; uppermost leaves bracteal, simple or with fewer lateral lobes. Capitula globose, 2.0–2.5 mm in dia, numerous, divergent or drooping, on short peduncles, approximate on short branches, usually in long pyramidal paniculate inflorescence. Involucre glabrous. Outer involucre bracts linear-oblong, green; inner oval or almost round, with wide scarious border, lustrous. Receptacle convex, glabrous. Peripheral florets pistillate, 10–20, filiform, punctate-glandular; their stigma lobes narrowly linear, obtuse, exserted from corolla tube; disk florets bisexual, 12–30, their corollas cup-shaped-tubular, glabrous; anthers narrowly linear, apical appendages of anthers long, acute, basal appendages very short, subacute; style shorter than stamens, stigma lobes linear, straight,

weakly divergent, apically ciliate. Achenes 0.8–0.6 mm long, oblong-ovate, flattened, with small round areola at apex, scarcely bordered. Flowering August to September.

Weedy places near dwellings, kitchen-gardens, gardens.—*European part*: Upper Dniester, Upper Dnieper, Volga-Don, Trans-Volga, Lower Don, Black Sea Region, Bessarabia, Crimea; *Caucasus*: Eastern and Western Transcaucasia, Talysh; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan, Syr-Darya, Pamiro-Alai, Amu-Darya, mountainous Turkmenia. *General distribution*: Central Europe, Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran, Dzhungaria-Kashgaria, China, Japan, Mongolia, North America (introduced). Amman's and Gmelin's figures are the type for this species.

Economic Importance. The yield of essential oil is 0.1–0.64% (according to Goryaev). According to the data of Joshikazu Imade (1937), this oil contains cineole and a substance with the composition $C_{10}H_{16}O$; this substance was analyzed in detail by Asahina and Ioshitomi (1917) and along with artemisia ketone, its isomer, isoartemisia ketone, was also found in the oil. This ketone could be isolated from the mother liquor left behind after obtaining the semicarbozone of artemisia ketone. Seisi Takagi (1928), extending his investigations of the Japanese *A. annua*, added two more new components, viz. cadinene and caryophyllene, to the four components already known in the oil. Based
491 on the investigations of Rutovsky and Vinogradov (1929), the oil contains α -pinene, cineole, camphene, artemisia ketone and isoartemisia ketone, a small quantity of borneol, acetic and butyric acids, cumaldehyde (presumably semicarbozone) and phenol (probably eugenol). A small quantity of alkaloids was found in the underground parts (Lazurevsky and Sadykov, 1939; Massagetov, 1947). According to field observations (Yunatov, 1954), cattle do not graze on it when green.

The presence of alkaloids is confirmed by the data of M.I. Goryaev, G.K. Kruglykhina, and E.I. Satdarova (1959).

Series 13. Auratae Poljak.—Plants glabrous; leaves pinnatisect or twice pinnately cut with linear-lanceolate or more often filiform-linear lobes.

54. **A. palustris** L. Sp. pl. (1753) 846; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 184; DC. Prodr. VI, 120; Ldb. Fl. Ross. II, 593; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 529; Komar. Fl. Manchzh. III, 661; Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV, 683; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1036; Krascheninn. in Kryl. Fl. Zap.

Sib. XI, 2817; Grub. Kونس. Fl. Mong. 267.—**lc.**: Gmel. Fl. sib. II, tab. 55.—**Exs.**: GRF No. 3153a, b, c.

Annual. Plant glabrous, with slender vertical root. Stem (4)10–50 cm high, erect, finely ribbed, green or violet-brownish, branched sometimes from base itself with rather long, upward spreading branches, less often simple. Leaves green, except lowermost sessile, with auricles, mostly 2–5 cm long, 1.5–3.0 cm wide, simple, pinnate or almost twice pinnately cut into narrow filiform-linear, somewhat thick lobes, 2–3 cm long and 0.2–0.5 mm wide, with scarcely visible punctate glands; bracteal leaves smaller, more often simple pinnate, divergent. Capitula subglobose, 2–3 mm in dia, 2–10, clustered in compact, lax or more or less approximate heads or short racemes forming paniculate inflorescence. Involucral bracts broadly oval, spatulately elongated, lustrous; outer bracts with green herbaceous midrib and wide, scarious, transparent or brownish margin; inner membranous. Receptacle convex-conical, glabrous. Peripheral florets pistillate, 11–13, filiform-tubular; their stigma lobes narrowly linear, obtuse, divergent, exerted from corolla tube; disk florets 28–30, their corollas conical, glabrous, punctate-glandular; anthers linear, apical appendages of anthers acute, basal appendages short, subobtuse; stigma lobes short, linear, apically ciliate, after anthesis divergent. Achenes 0.5–0.7 mm long, oblong-ovate, flattened, brown, with flat round areola at apex. Flowering August.

Steppe meadows, sandy banks of rivers and lakes, gravel beds, abandoned fields, pastures and roadsides.—*Western Siberia*: Altai (Chuya steppe); *Eastern Siberia*: Angara-Sayans, Dauria; *Far East*: 492 Zeya-Bureya (western part) *General distribution*: Mongolia, northern China. Described from Siberia. Type in London.

55. **A. aurata** Kom. in Tr. Peterb. Bot. Sada, XVIII (1901) 422; Kom. Fl. Manchzh. III, 661; Nakai Fl. Korean. II, 30.—Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1036.

Annual. Plant glabrous, with slender roots. Stem 15–60(80) cm high, erect, strongly branched, with long, three-angled, acute-scabrous, arcuate branches. Lower cauline leaves long-petiolate, 6–12 cm long, twice pinnately cut, lobes narrowly linear-lanceolate, acute, simple or with linear teeth; middle cauline leaves smaller, short-petiolate, with narrowly linear or almost filiform lobes; upper leaves sessile, simple, pinnate; uppermost leaves bracteal, undivided, narrowly linear-lanceolate or with 1–2 pairs of linear, acute lobes. Capitula sessile, subglobose, 2–3 mm long, in heads of 2–5 forming a lax panicle. Involucral bracts broadly oval or round, with or without narrow green keel, membranous, lustrous. Receptacle convex, conical, glabrous.

Peripheral florets pistillate, 13–14, their corollas narrowly tubular, toward base slightly broadened, glabrous, punctate-glandular; stigma lobes exserted from tube, linear, obtuse, divergent; disk florets bisexual, 14–25, their corollas to 1.5 mm long, conical, golden-yellow, anthers linear; stigma lobes linear, straight, short, apically ciliate, after anthesis somewhat divergent. Achenes very small, very similar to those of the preceding species.

South-facing stony slopes, in crevices of rocks, in the zone of coniferous-deciduous forests.—*Far East*: Ussuri. *General distribution*: Japan, north China, north Korea. Described from northeastern China. Type in Leningrad.

Note. This species is very similar to *A. palustris* L. from which it is distinguished by a more complex dissection of the leaves.

Section 4. Absintium DC. in Lam. and DC. Fl. Franc. ed. 3 (1815) 189.—Herbaceous perennials or annuals, or even low semishrubs (shrubs), more or less densely covered with white, appressed or erect, dichotomous or Malpighian[sic.] hairs, less frequently almost glabrous; receptacle pubescent, with, very rarely without, floral [sic.] hairs; leaves usually twice or thrice pinnately cut.

Section 1. Argyrophyllae Poljak.—Leaves twice pinnately cut or twice ternate; capitula hemispherical, globose or even ovoid, 2–4 mm in dia; stem erect or ascending.

56. *A. caucasica* Willd. Sp. pl. III (1804) 1823; Boiss. Fl. or. III, 374; Grossh. Fl. Kavk. IV, 140.—*A. alpina* Pall. in Willd. Sp. pl. III, 1824; MB. Fl. taur.-cauc. II, 297.—*A. lanata* DC. Prodr. VI (1837) 123; Ldb. Fl. Ross. II, 596; *A. monticola* C. Koch in Linnaea, XXIV (1851) 347; Grossh. Fl. Kavk. IV, 140.—*A. rupestris* Pall. Ind. Taur. (1801); MB. Casp. app. 210 (non L.).—*A. chevsurica* Somm. and Lev. in Bull. Soc. Bot. Ital. (1898) 130.—*A. argentatum* Klok. in Bot. Mat. Gerb. Akad. Nauk SSSR, XVI (1954) 366.—*A. grossheimii* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 410 p. p.; Grossh. Opred. (1949) 463, nomen.—*Absinthium alpinum* Bess. in Bull. Soc. Nat. Mosc. (1829) 240.—**Exs.**: Herb. Fl. Cauc. No. 496.

Perennial. Whole plant silvery-white from dense, silky, appressed hairs. Root thick, vertical, with perennial, branched, short, woody shoots, which together with young, sterile, very short, densely leafy shoots form rather compact tussocks. Fertile stems few or rather numerous, (8)12–15(20) cm high, erect, simple, weakly leafy. Leaves of sterile shoots and lower cauline leaves petiolate, 1.0–1.8 cm long,

lamina round or broadly round, twice pinnately cut or ternate, terminal lobes 4–6 mm or 5–10 mm long (var. *grossheimii* Poljak.), narrowly lanceolate-linear, short-acuminate; middle and upper cauline leaves sessile, simple pinnatisect or serrate, sometimes ternate. Capitula in simple raceme, on short peduncles, subglobose, 4–5 mm long and 3.0–4.5 mm in dia, solitary or few clustered in rather narrow, interrupted racemose-panicle or raceme. Involucral bracts densely pilose, with wide scarious margin; outer involucral bracts elliptical, inner lanceolate. Receptacle hairy. Peripheral florets pistillate, 5–8; their corollas narrowly tubular, hairy in upper part, stigma lobes linear, truncate; disk florets rather numerous (18–20), bisexual, their corollas conical, apically densely hairy; anthers linear, apical appendages of anthers narrowly linear, subacute, basal appendages much smaller, subacute, stigma lobes linear, obtuse, apically ciliate, after anthesis recurved. Achenes to 1.2 mm long, oblong-ovoid, somewhat flat, dark brown, smooth, with round convex apex. Flowering August.

Steppe, outlier hillocks and low hills.—*European part*: Black Sea Region, Crimea, Lower Don; *Caucasus*: Ciscaucasia, Dagestan, Eastern, Western and Southern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from Caucasus. Type in Berlin.

Note. A doubtful species displaying the closest affinity with *A. laxa* Lam., found in the Alps. It is distinguished from the latter by minor characters such as denser pubescence of the corolla and the involucral bracts. As regards *A. argentata* Klok., characters such as little variation in the size and shape of the leaf lobes, their number, as well as the size of the capitula and the density of pubescence on the vegetative organs, enables us to separate this plant as an ecological form.

57. *A. splendens* Willd. Sp. pl. III (1804) 1822; DC. Prodr. VI, 123; Ldb. Fl. Ross. II, 596; Boiss. Fl. or. III, 375; Grossh. Fl. Kavk. 494 IV, 139, Opred. Rast. Kavk. 463.—*A. peduncularis* MB. Fl. taur.-cauc. III (1819) 566.—*A. pedunculata* Steudel. Nomencl. (1822).—? *A. mutellina* S.G. Gmel. Reise. I (1770) 159.—*Absinthium splendens* (Willd.) Bess. in Bull. Soc. Nat. Mosc. (1829) 238.—*A. peduncularis* Stev. in Mém. Soc. Nat. Mosc. IV (1835) 63.

Perennial. Tap root woody, with strongly condensed, ascending, woody, perennial, densely leafy shoots usually forming compact tussock. Fertile stems few, sometimes single, (10)15–25 cm high, erect or bent, ascending, brownish, obtusely ribbed, simple, weakly leafy, more or less pubescent. Leaves on both sides silvery from dense, silky, appressed hairs; lower cauline leaves long-petiolate, highly variable in size, 2.0–4.5(6.0) cm long and 1.5–2.5(4.0) cm wide, twice pinnate or twice

pinnate-ternate, or twice ternate, their terminal lobes linear, acute, 4–10(12) mm long; cauline leaves shorter, less compound; uppermost leaves linear. Capitula in simple raceme, low, remote, on long (to 2–3 cm long) peduncles; upper capitula on short peduncles, more or less approximate, hemispherical, narrowed toward base, 5–7 mm in dia. Involucral bracts with wide scarious margin; outer bracts oval, dark brown along midrib, hairy; inner bracts narrower, weakly hairy. Receptacle convex, hemispherical, with long hairs. Peripheral florets pistillate, 9–12, their corollas filiform-tubular, with 2 teeth, stigma lobes narrowly linear, scarcely acuminate, exerted from tube; disk florets 33–56, bisexual, their corollas tubular-conical, with erect hairs in upper part; anthers linear, apical appendages of anthers long, acute-subulate, basal appendages smaller, subacute; stigma lobes narrowly linear, truncate, ciliate, recurved after flowering. Achenes narrowly prismatic, angled, flat, dark brown, with convex areola at apex, scarcely bordered. Flowering August.

On loamy, rubbly, meadow, high-mountain slopes, river deposits, old moraines, at upper limit of forest.—*Caucasus*: Ciscaucasia, Dagestan, Eastern and Southern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from Armenia. Type in Berlin.

58. **A. frigida** Willd. Sp. pl. III (1804) pag. 1838; DC. Prodr. VI, 124; Ldb. Fl. Ross. II, 597; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 537; Kryl. Fl. Alt. III, 656; Kom. Fl. Manchzh. III, 680; Fedtsch. Perech. Rast. Turk. IV, 203; Rydb. North Am. Fl. 34, part 3, 258; 497 Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV, 655; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 361; Kryl. Fl. Zap. Sib. XI, 2797.—*A. frigida* v. *typica* v. *intermedia* Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 2 (1866) 358.—*A. frigida* ssp. *willdenoviana* (Bess.) Krasch. in Kryl. Fl. Zap. Sib. XI (1949) 2798.—*A. frigida* ssp. *gmeliniana* (Bess.) Krasch. Ibid. 2798.—*A. frigida* ssp. *parva* Krasch. Ibid. 2798.—*A. frigida* v. *argyrophylla* Trautv. op. cit. 358; Kryl. Fl. Alt. III, 656.—*A. jeniseensis* Spreng. Syst. veg. III (1826) 486.—*A. argyrophylla* Ldb. Fl. Alt. IV (1833) 66; DC. Prodr. VI, 123; Ldb. Fl. Ross. II, 598; Kryl. Fl. Zap. Sib. XI, 2799.—*Absinthium frigidum* Bess. and *A. frigidum willdenoviana* Bess. in Bull. Soc. Nat. Mosc. (1829) 251, 256.—**IC.**: Ldb. Ic. pl. Fl. Ross. V (1834) tab. 463.—**Exs.**: GRF Nos. 66, 3172a, b, c.

Perennial. Whole plant densely covered with bifid, slender, appressed, silky hairs. Root woody, with perennial, woody spreading branches, which together with young sterile leafy shoots form more or less dense tussocks. Fertile stems rather numerous or few, 15–30 cm or 5–10 cm (var. *parva* (Krasch.) Poljak.) or even 30–50 cm (var.



- 1 — *Artemisia abrotanum* L., upper part of plant, bisexual disk floret, achene.
 2 — *A. gmelini* Web. ex Stechm., upper part of plant, peripheral pistillate floret, pistil, stamen, bisexual disk floret.

gmeliniana (Bess.) Poljak.) high, basally ascending or erect, usually strong, leafy, densely hairy, later glabrous or subglabrous in lower half. Leaves short-petiolate or sessile (var. *argyrophylla* (Ldb.) Kryl.) almost twice pinnate or sometimes ternate, most often 1–2 cm long and 7–15 mm wide; lower pinnae, 2–3-fid or undivided, others crowded at leaf apex, pinnately divided or ternate, with lanceolate-linear, acute lobes, 2–5 mm long and 0.5–1.0 mm wide; upper bracteal leaves palmately cut or ternate. Capitula subglobose or globose, 3–4(5) mm wide, divergent or drooping, in narrowly paniculate or racemose inflorescence. Involucral bracts with white scarious border; outer bracts oblong-elliptical, subobtusely, densely hairy, inner bracts linear-oblong, hairy only along margin. Receptacle convex, hairy. Peripheral florets pistillate, 9–12, their corollas narrowly or almost filiform-tubular, with 2 teeth, glabrous, punctate-glandular; stigma lobes filiform-linear, exerted from corolla tube, weakly divergent; disk florets bisexual, 22–36, their corollas conical, yellow, less often purple-pink, glabrous, sometimes hairy (f. *argyrophylla* (Ldb.) Poljak.). Anthers linear, apical appendage of anthers linear-subulate, elongate, their basal appendages short, round; stigma lobes scarcely exerted from corolla, linear, apically ciliate, arcuate after flowering. Achenes 1 mm long, pyriform, somewhat flat, with scarcely visible fine ribs, brown, apically flat with border on one side. Flowering August.

Steppe zone on rubbly stony slopes of [mud] volcanic cones, low hills, sometimes on sand dunes and terraces, edge of pine forests or, 498 less often, in old fields and steppe meadows.—*European part*: Volga-Kama, Trans-Volga; *Soviet Central Asia*: Aralo-Caspian Region (northern part), Lake Balkhash Region, Dzhungaria-Tarbagatai; *Western Siberia*: Upper Tobol, Irtysh, Altai, Angara-Sayans, Dauria, Lena-Kolyma. *General distribution*: Mongolia, North America. Described from Siberia, probably from Gmelin's collection. Type in Berlin.

Note. As in *A. rutifolia* Steph., in *A. frigida* Willd. the corolla is hairy or glabrous in the upper part, but the bracteal hairs ("receptacle hairy") sometimes are almost absent.

Economic Importance. According to Rabak (1912), the plant, particularly at and after anthesis, contains an essential oil whose yield varies from 0.26 to 0.41% of the fresh weight of the plant; but when the plant is dried drops to 0.07%. According to Goryaev (1952), the oil is yellow in color; its constants are: D^{22}_{20} —0.927–0.940; α_D —from $23^{\circ}40'$ to $25^{\circ}10'$; n_D —1.4716; acid number—1.2; ester number—31.8; ester number after acetylation—139–143. It dissolves in 80% alcohol in the ratio of 1:2; in 90% alcohol—1:0.5. American oil contains 38–48% l-borneol in bound form and to 35% in free form; 18–20% cineole; 8–10% l-fenchone; capryl and evant acids, esters of valerian, evant, undecyl and formic acids. According to reports of perfumers

(Rabak, 1912; Goryaev, 1952), the oil is suitable for imparting fragrance to soaps. According to Yurensky (1850), the plant is a nutritive fodder for sheep. *A. frigida* Willd. is highly valued as fodder in Canada and the USA during winter. A cold infusion of the herb is used as a diuretic and mild purgative (Hall and Clements, 1923).

59. *A. austriaca* Jacq. in Murr. Syst. (1784) 744; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 47; DC. Prodr. VI, 112; Ldb. Fl. Ross. II, 583; Boiss. Fl. or. III, 369; Kryl. Fl. Alt. III, 649; Fedtsch. Perech. Rast. Turk. IV, 199; Hegi, Ill. Fl. VI, 2, 642; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 360; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2800; Grossh. Opred. Rast. Kavk. 464; Poljak. in Majeovski, Fl. 586.—*A. repens* Pall. ex Willd. Sp. pl. III (1800) 1840; Less. in Linnaea, IX, p. 189.—*A. nivea* Redowsky ex Willd. Enum. pl. II (1813) 863.—*A. frigida* Eichw. Casp. cauc. (1833) 31.—*A. frigidae* var. *folis magis dissectis* Ldb. Fl. Alt. IV (1833) 66.— *Ic.*: Hegi, Ill. Fl. VI, 2, p. 642.—*Exs.*: GRF No. 1522.

Perennial. Whole plant whitish from dense silky hairs. Root with slender, woody, creeping or obliquely ascending rhizomes. Stems few, basally ascending or erect, 20–60 cm high, branched from base or above with spreading branches, with densely leafy sterile shoots. Basal leaves petiolate, 1.5–4.0 cm long and 1–3 cm wide, oval, twice pinnately cut, lobes 1–2 pairs, palmately- or pinnately- cut into linear, acuminate, 2–12 mm long and 0.5–1.0 mm wide secondary lobes, other leaves sessile, with basal lobes; upper leaves ternate; uppermost leaves 499 bracteal, undivided, linear. Capitula hemispherical or ovoid, about 2 mm in dia, divergent or drooping, on long peduncles, more or less in broadly paniculate inflorescence. Involucral bracts hairy; outer bracts almost linear or lanceolate-linear; inner oval, with scarious border. Receptacle glabrous or with occasional floral[sic., receptacular bristles] hairs (var. *neglecta* Krasch.) or with rather numerous hairs (var. *barabensis* Serg.). Peripheral florets usually 5–7, their corollas very small, almost filiform, broadened toward base; stigma lobes filiform, divergent; disk florets bisexual, 7–8; their corollas narrowly linear, apically hairy, anthers linear, apical appendage of anthers acute, basal appendage short, subacute. Achenes about 1 mm long, oblong, flat, with small convex areola at apex. Flowering August.

Alkaline meadows, sandy-loam steppe, sands near pine forests, often in old fields, pastures, roadsides, near dwellings, in forest and steppe zones.—*European part*: Karelia-Lapland, Dvina-Pechora, Ladoga-Ilmen, Baltic Region, Upper Dnieper, Upper Volga, Volga-Kama, Volga-Don, Trans-Volga, Lower Volga, Lower Don, Black Sea Region, Middle Dnieper, Upper Dniester; *Caucasus*: Ciscaucasia,

Dagestan, Eastern Transcaucasia; *Soviet Central Asia*: Aralo-Caspian Region (northern part), Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan; *Western Siberia*: Upper Tobol, Irtysh, Ob River Area (southern part), Altai; *Far East*: Ussuri (introduced). *General distribution*: Central Europe, Western Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from Austria. Type in Vienna.

Note. I.M. Krascheninnikov (*Fl. Zap. Sib.*, XI, p. 2800) distinguishes var. *neglecta* Krasch. by the presence of short, sparse hairs on the receptacle, but later (*Mat. po Istor. fl. i Rast.* III (1958) 91) he reports that var. *barabaensis* Serg. is also distinguished by these very same characters.

Economic Importance. According to the investigations of Kazakevich and Sobolevskaya (1923), the yield of essential oil is 0.46% (of weight of dry matter); at maturity the oil has the following constants: D_4^{20} —0.9319; D —3.44°; n_D^{21} —1.47; acid number 6.33; ester number 47.66; ester number after acetylation—118.95. It is soluble in 70% alcohol in the ratio of 1:1.8; in 80% alcohol 1:0.5; in 90% alcohol it is entirely soluble. The oil contains: cineole—30%, α and β —thujones—29%, thujyl alcohol—2% and thujylacetate—6%. According to the opinion of Goryaev (1952), the oil apparently contains a considerable quantity of azulene. Its reaction to aldehydes is positive, to phenols and ketone, negative. According to the data of Dionisev and Chernomaz (1938), the oil contains 0.667% alkaloids and 0.98% glucosides, which apparently is poisonous to animals (Larin, 1956).

60. **A. caespitosa** Ldb. *Fl. Alt.* IV (1833) 80; Bess. in *Bull. Soc. Nat. Mosc.* IX, 68; DC. *Prodr.* VI, 118; Ldb. *Fl. Ross.* II, 590; Kryl. *Fl. Alt.* III, 651; Krascheninn. in Kryl. *Fl. Zap. Sib.* XI, 2801.—**lc.**: Ldb. *lc. pl. Fl. Ross.* V, tab. 472.—**Exs.**: GRF No. 3155.

500 Perennial. Whole plant whitish or greenish-gray from fine and long, silky, approximate hairs. Root slender, vertical, bearing short (0.5–2.0 cm), strongly branched and spreading, perennial, sterile shoots producing arise fertile, simple, erect or somewhat spreading 3–15 cm high stems. Basal leaves small, undivided, linear-oblong, withering before flowering; leaves above them petiolate, 1.0–1.5 cm long, ternate, lobes lanceolate-linear, acute, 2–5 mm long; middle cauline leaves divided into 3–5 lobes, sometimes pinnately cut, often with 2 lobes at base; upper bracteal leaves ternate or undivided, lanceolate-linear. Capitula sessile, globose-ovoid, 2–3 mm in dia, crowded or in depauperate simple raceme or additionally on short lateral branches. Involucral bracts oval-elliptical, convex, light greenish along midrib, with wide scarious margin; outer bracts hairy, somewhat wider than sub-glabrous inner bracts. Receptacle convex, glabrous. Peripheral florets pistillate,

9; their corollas narrowly tubular, with 4 teeth, glabrous, punctate-glandular, in upper part purple-pink, stigma lobes exerted from corolla tube, linear, obtuse, arcuate; disk florets bisexual, 14, their corollas conical, in upper part purple, glabrous; anthers on shorter filaments, linear, apical appendage of anthers long, acute, basal appendages short, round; Stigma lobes after anthesis weakly exerted from corolla tube, arcuate. Achenes up to 1.2 mm long, somewhat flat, oblong-ovoid, dark brown, with flat[smooth] round apex. Flowering August.

Alkaline and poor rubbly soil, desert-steppe zone.—*Western Siberia*: Altai (Chuya steppe). *General distribution*: Mongolia. Described from Altai. Type in Leningrad.

61. *A. cuspidata* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1936) 349.

Perennial. Plant more or less densely caespitose, whitish from dense long silky appressed hairs; sterile shoots rather numerous, 5–15 mm high; fertile stems 1–2, erect, 6–10 cm high, simple, more or less densely leafy. Leaves of sterile shoots and lower cauline leaves short-petiolate, 5–10 mm long, ternate, lobes 4–7 mm long, linear or lanceolate-linear, thin-acuminate; bracteal leaves shorter, undivided or ternate, with short lateral lobes. Capitula hemispherical, 4–5 mm in dia, 4–14, upward-spreading or divergent, on short peduncles; upper capitula approximate, lower remote, in spicate or in lower part in almost racemose inflorescence. Involucre with dense, appressed and long hairs; outer bracts linear, inner linear-lanceolate, with wide, 501 scarious border. Receptacle hairy[setose]. Corolla of bisexual disk florets tubular-conical, yellow, glabrous. Flowering August.

Stony steppe slopes, calcareous rocks, in forest zone.—*Eastern Siberia*: Dauria (Olkhon Island and east bank of Lake Baikal), Lena-Kolyma (Aldan River near mouth of Maya River). Described from Lake Baikal. Endemic. Type in Leningrad.

62. *A. schmidtiana* Maxim. in Bull. Acad. Sc. Pétersb. VIII (1872) 537; Pampan. in Nouv. Giorn. Bot. Ital. n.s. XXXIV (1927) 699.—*A. sericea* F. Schmidt, Fl. Sachal. in Mém. Acad. Pétersb. VII, XII, No. 2 (1868) 150; Sugaw. Ill. Fl. Saghal. IV, 1829; Hara, Enum. Spermatoph. Japonic. 125.—*lc.*: Sugaw, op. cit. tab. 838.

Perennial. Semishrub to 60 cm high, silvery from dense, slender, appressed, silky hairs; stem at base subglabrous, densely leafy above, branched, with straight, long, more or less divergent branches. Leaves petiolate, 4–5 cm long, twice pinnately cut, lobes 2 pairs, remote, linear, 1.5–2.0 cm long and about 1 mm wide, with 1–2 narrowly linear, 5–12 mm long lobules, apical bracteal leaves undivided, narrowly

linear, up to 1.5 cm long. Inflorescence densely leafy, pyramidal-paniculate. Capitula on long leafy peduncles, hemispherical, 5–6 mm in dia. Involucral bracts silvery-woolly; outer bracts linear; inner larger, oblong, with whitish-scarious margin. Receptacle convex, hemispherical, tuberculate, setose. Peripheral florets pistillate, 3–8, narrowly tubular, with 2 teeth, almost to tip covered with long white hairs; stigma lobes exerted from corolla tube, linear, obtuse, arcuate; disk florets bisexual, 21–33, their corollas conical, punctate-glandular, yellow, hairy in upper part, anthers lanceolate, apical appendages of anthers elongate, basal appendages shorter, subobtusate; style usually shorter than tube, stigma lobes linear, long, recurved at the end of vegetative growth of plant. Achenes oblong, indistinctly ribbed, somewhat flat, apex flat[smooth], scarcely bordered. Flowering September.

Sandy coasts and dry stony slopes.—*Far East*: Southern Sakhalin, Kuril Islands (Sikotan). *General distribution*: Japan. Described from Japan. Type in Leningrad.

Economic Importance. In Japan, sometimes cultivated as an ornamental plant for its silvery leaves.

63. *A. sericea* Web. ex Stechm. Artem. (1775) 16; DC. Prodr. VI, 122; Ldb. Fl. Ross. II, 595; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 537; Kryl. Fl. Alt. III, 653; Fedtsch. Perech. Rast. Turk. IV, 202; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 361; Kryl. Fl. Zap. Sib. XI, 2795; Poljak. in Majevski, Fl. 585; Bobrov in Bot. Mat. Gerb. Bot. Inst. XX, 16.—*A. holosericea* α . *grandiflora* and β .
 502 *parviflora* Ldb. Fl. Alt. IV (1833) 63; DC. Prodr. VI, 123.—*A. sericea* var. *gmeliniana* and var. *ledebouriana* and var. *pallasiana* Bess. in Bull. Soc. Nat. Mosc. IX (1836) 14.—*A. sericea* Stechm. var. *steveniana* Bess. ibid. 14.—*A. sericea* Web. var. *nitens* (Stev.) DC. Prodr. VI (1837) 122.—*A. nitans* (Bess.) Stev. ex Krasch. in Spisok Rast. Gerb. Fl. SSSR, XI (1949) 50.—*A. sericea* var. *grandiflora* DC. and var. *parviflora* DC. Prodr. VI (1837) 122; Ldb. Fl. Ross. II, 2, 595.—*A. czekanovskiana* Trautv. in Tr. Peterb. Bot. Sada, V, 1 (1877) 72.—*A. sericea* var. *nitens* f. *parviflora* Pamp. Nuov. Giorn. Bot. Ital. n. s. XXXVI (1930) 700.—*Absinthium sericeum* Bess. in Bull. Soc. Nat. Mosc. VIII (1829) 237.—*A. grandiflorum* Bess. ibid. 232.—*A. nitens* Stev. ex Bess. ibid. 235.—*Ic.*: Gmel. Fl. sib. II, 131, t. 64, fig. 1; Ldb. Ic. pl. Fl. Ross. V, 459. imperfect.—*Exs.*: GRF Nos. 3174a, 3175, 3176a, 3292, 3293.

Perennial. Root vertical, woody, bearing sterile densely leafy shoots up to 20–35 cm high. flowering stems 40–70 cm high, few or single, straight or at base ascending, brownish, pubescent in upper part, subglabrous below, simple or branched above, leafy. Leaves on both

sides covered with slender, silky, appressed hairs but more densely beneath and hence whitish-silvery; lower leaves withering early, smaller than middle, petiolate, ternate or palmately cut, with undivided leaflets; middle leaves 3–5 cm long and 2–4 cm wide, twice pinnately cut, with 1–2 pairs of lobes, terminal lobe pinnately cut but sometimes palmately cut, undivided, linear or lanceolate-linear, 10–17 mm long and 1–2 mm wide, acute, with narrow, thick stripe and distinct midrib beneath along margin, upper leaves sessile, simple pinnate or ternate. Capitula hemispherical, 4–6(9) mm in dia, drooping, in narrowly paniculate-racemose inflorescence, less frequently in deparperate panicle with long lateral branches, or in simple elongate raceme. Involucral bracts whitish-hairy; outer bracts oblong-ovate or lanceolate, acuminate, with narrow and brownish scarious margin; inner bracts longer than outer, elliptical, with wide scarious-whitish margin. Receptacle convex, hemispherical. Peripheral florets pistillate, 12–14; their corollas narrowly tubular, toward base somewhat broadened, punctate-glandular; stigma lobes exserted from corolla tube, linear, obtuse, arcuate; disk florets bisexual, numerous (40–65); their corollas conical, hairy above, glabrous below; anthers linear, apical appendages of anthers long, acute, basal appendages short, round. Achenes to 1.2 mm long, oblong-conical, angular-ribbed apically flat[smooth], along border unevenly toothed. Flowering August.

Steppe, sometimes weakly saline meadows, along slopes of hillocks and mountains, often rubbly and stony, in southern part of forest and forest-steppe zones.—*European part*: Volga-Kama, Volga-Don, Trans-Volga; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: 503 Angara-Sayans, Yenisei, Dauria, Lena-Kolyma; *Soviet Central Asia*: Lake Balkhash Region (northern part). *General distribution*: Northern Mongolia. Described from Siberia. The cited figure by Gmelin is the type.

Note. The following forms can be distinguished 1) *f. pallasiana* (Bess.) Poljak.—with small capitula, mainly associated with steppe slopes and thickets of steppe shrubs in the central Urals; 2) *f. nitens* (Stev.) Poljak.—with larger capitula, wide, ovate-lanceolate inner involucral bracts, and a lax, weakly branched, often racemose panicle, distributed mainly in mountainous Central and Eastern Siberia; 3) *f. czekanovskiana* (Trautv.) Poljak.—with large many-flowered capitula usually in a simple racemose inflorescence, distributed in the northern part of Yakutia, evidently in the forest-tundra.

64. **A. aschurbajevii** Winkl. in Tr. Peterb. Bot. Sada XI (1892) 332; Fedtsch. Fl. Pam. (1903) 117; Fedtsch. Perech. Rast. Turk. IV, 203.—*A. sericea* var. *turkestanica* Winkl. op. cit. 203.—Exs.: GRF No. 3294.

Perennial. Rhizome not thick, woody, creeping, bearing numerous, short, sterile, densely leafy shoots, loosely caespitose; stems few, sometimes numerous, (15)20–30(50) cm high, erect or at base arcuate, ascending, weakly ribbed or subcylindrical, simple, leafy, more or less hairy. Leaves on both sides densely covered with fine, silky, appressed hairs; lower cauline leaves and leaves of sterile shoots petiolate, 1.5–2.5(3.5) cm long and 1.2–2.0(3.2) cm wide, lamina round or reniform, twice ternate or pinnately-ternate, lobes petiolulate, 3–5, usually ternately divided, terminal lobes lanceolate, obtusely acuminate, more often 5–10 mm long; middle cauline leaves short-petiolate or sessile; uppermost bracteal leaves, undivided, linear-lanceolate. Capitula in simple raceme, half as long as stem, on short peduncles; all capitula more or less remote or only in lower part of inflorescence but approximately above, hemispherical, 5–7 mm in dia, divergent or drooping. Involucral bracts elliptical, herbaceous[sic.,? carinate] along midrib, hairy, with wide, dark brown, scarious, irregularly incised margin. Receptacle convex, hemispherical, hairy. Peripheral florets pistillate, 10, narrowly tubular; their stigma lobes distinct, linear, recurved; disk florets numerous (40–55), their corollas conical, in upper part hairy, below glabrous, sometimes entirely hairy, anthers linear, apical appendages of anthers long, acute, subulate, basal appendages considerably shorter, subacute, style as long as corolla tube, stigma lobes erect, linear, apically ciliate, recurved at maturity of achene. Achenes about 1 mm long, oblong, indistinctly ribbed. Flowering July to August.

504 Mountain-meadow and meadow-steppe slopes of mountains, at timberline.—*Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai. Described from Pamir. Type in Leningrad.

Note. *A. aschurbajevii* C. Winkl. is very similar to *A. sericea* Web. and is distinguished by a somewhat lower height of the stem, simple racemose inflorescence, smaller size of the lamina, and by the ecology and range.

Series 2. *Crossostephioides* Poljak.—Leaves linear-lanceolate, toward base narrowly cuneate, in upper part undivided or with 3 short or long teeth.

65. *A. lagocephala* (Bess.) DC. Prodr. VI (1837) 122; Turcz. Fl. baic.-dahur. II, 69; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 531; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1042.—*A. lagocephala* var. *kruhaiana* (Bess.) Glehn in Maxim. op. cit. 532; Krascheninn. in Spisok. Rast. Gerb. Fl. SSSR, XI, 48.—*A. lagocephala* var. *besseriana* (Bess.) Pamp. f. *α. integrifolia* (Ldb.) Pamp. in Nuov. Giorn. Ital. Bot. n. s. XXXIV (1927) 676.—*A. besseriana* var. *triloba* and var. *integrifolia*

Ldb. Fl. Ross. II (1846) 590.—*A. lithophila* Turcz. Fl. baic.-dahur. II (1856) 69, nom.—*A. kruhsiana* Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 22; DC. Prodr. VI; Ldb. Fl. Ross. II, 576.—*Absinthium lagocephalum* Fisch. ex Bess. in Bull. Soc. Nat. Mosc. VIII (1829) 233.—**!c.**: Gmel. Fl. sib. II, tab. 61, f. 1, 2.—**Exs.**: GRF No. 3291a, b.

Perennial. Semishrub (20)30–60(70) cm high. Root woody, thick, cordlike, with more or less numerous, strongly reduced, ascending, woody, perennial, sterile shoots in upper part covered with brownish-gray bark, with leaf rosettes at apex. Fertile stems rather numerous, erect, ribbed, short-hairy, leafy, simple or branched in upper part, with short or somewhat long, upright branches. Leaves short-petiolate or sessile, dark green and weakly hairy or subglabrous above, whitish, finely tomentose beneath from appressed hairs; lower cauline leaves and leaves of nonflowering shoots 3–7 cm long and 3–12 mm wide, undivided, narrowly lanceolate, acuminate or undivided, obcuneate, usually with 3–5 short, subacute or linear, longer, subobtuse teeth; cauline leaves lanceolate or linear-oblong, short-acuminate or obtuse, round, gradually cuneately narrowed toward base; bracteal leaves small, not exceeding lateral shoots. Capitula hemispherical, narrowed toward base, 4–7 mm in dia, on more or less long peduncles, divergent or drooping, in narrow racemose inflorescence. Involucral bracts oblong-lanceolate, with wide, scarious, incised-fimbriate margin; outer bracts densely hairy; inner subglabrous or weakly hairy. Receptacle convex, hemispherical, hairy, sometimes glabrescent. Peripheral florets pistillate, 9–14; their corollas narrowly tubular, with 2–3 teeth, punctate-glandular, pubescent or glabrous, stigma lobes 2 (very rarely 3), narrowly linear, obtuse, after anthesis weakly recurved; disk florets bisexual, 28–55–80; their corollas up to 3 mm long, narrowly cup-shaped, conical, with hairy teeth, glabrous, punctate-glandular, anthers lanceolate, apical appendages of anthers long, acute, basal appendages small, obtuse, stigma lobes linear, obtuse, ciliate. Achenes up to 2 mm long, oblong, somewhat flat, indistinctly ribbed, with flat[smooth] apex, and short, indistinctly toothed border. Flowering August. (Plate XXVI).

Stony alluvium and rocky outcrops in alpine tundra.—**Arctic:** Arctic Siberia, Chukotka; **Eastern Siberia:** Angara-Sayans (eastern part), Dauria, Lena-Kolyma; **Far East:** Zeya-Bureya, Ussuri, Okhotsk. Endemic. Described from Eastern Siberia. Type in Kiev.

Note. The American species *A. alaskana* Rydb. is very similar to this species.

For our species, it is possible to distinguish var. *kruhsiana* (Bess.) Glehn., which is characterized by toothed incised basal leaves, partly by the absence of receptacular hairs, and partly by the simple racemose inflorescence; it grows in forest-tundra and partly in tundra.

Series 3. Rutifoliae Poljak.—Leaves twice pinnately cut or twice ternately divided.

66. **A. rutifolia** Steph. ex Spreng. Syst. Veg. III (1826) 488; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 22; DC. Prodr. VI, 106; Ldb. Fl. Ross. II, 576; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 531; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2789.—*A. turczaninowiana* Bess. op. cit. 23; DC. Prodr. op. cit. p. 106; Ldb. op. cit. 577; Boiss. Fl. or. III, 369; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 531; Kryl. Fl. Alt. III, 641; Fedtsch. Perech. Rast. Turk. IV; 196; Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV [sic., recte XXXIV], 706.—*A. turczaninowiana* β . *dasyantha* Schrenk Enum. pl. novar. (1841) 50.—*A. turczaninowiana* var. *falconeri* (Clarke) O. Fedtsch. Second Addendum to Fl. Pam. (1901) No. 82.—*A. turczaninowiana* var. *altaica* Kryl. op. cit. 641.—*A. falconeri* Clarke in Hook. Fl. Br. Ind. III (1882) 320.

Perennial. Semishrub, 25–80 cm high, with stocky, rather thick and strongly branched, woody stem covered with brownish-gray bark bearing numerous strongly leafy, erect or in part somewhat spreading branches that together with the dead remnants of previous year form more or less thick turf. All leaves petiolate, lacking lobes at base, grayish from fine felt of silky appressed hairs on both sides like young branches; lamina almost round or reniform, 0.6–2.0 cm long and 0.8–3.0 cm wide, twice pinnately cut or twice ternate, primary lobes 5, ternate or pinnately divided, secondary lobes linear-oblong, subobtusely, 2–12 mm long and 0.5–1.5 mm wide; lowermost as well as upper
506 leaves less compound, sometimes ternately divided; upper bracteal leaves undivided, linear. Capitula hemispherical, 3.5–5.0 mm in dia, pedunculate, divergent or drooping, in racemose or paniculate inflorescence; common receptacle glabrous or hairy. Involucre cup-shaped; outer involucre bracts oblong, whitish-tomentose, inner elliptical or oval, subglabrous, with wide scarious margin. Peripheral florets pistillate, 5–15, their corollas narrowly tubular, toward base gradually broadened, glabrous, punctate-glandular; stigma lobes somewhat exserted from corolla tube, linear, recurved; disk florets bisexual, 12–28, their corollas conical, glabrous or hairy, punctate-glandular; anthers linear, apical appendages of anthers long, scarcely acuminate, basal appendages short, acuminate; stigma lobes linear, apically broadened, ciliate, after flowering recurved. Achenes oblong-prismatic, angular-ribbed, with flat[smooth] apex and uneven border. Flowering August. (Plate XXII, Fig. 2).

Mountain-steppe, stony slopes of mountains.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, Dauria; *Soviet Central Asia*:

Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region. *General distribution*: Iran-Afghanistan (Afghanistan), western Himalayas, Dzhungaria-Kashgaria, Mongolia, Tibet. Described from Siberia. Type in Leningrad.

Economic Importance. According to the data of Bazilevskaya (1936), the leaves and capitula contain 0.85% essential oil in the dry matter, but according to the data of S.N. Kudryashev (1936)—0.21–0.36%. According to the data of M.I. Goryaev et al. (1954), the plants collected in 1950 from Dzhungarian Alatau in the vicinity of the village of Tsaritsyno yielded 0.48% oil of the dry weight of the herb. The oil is light green in color, with flowery odor and partially crystallizes on cooling; it shows a weak reaction to alkaloids and a negative reaction to phenols, cineole and azulene-forming sesquiterpenes. Constants of the oil are: n_D —1.4668; acid number 6.5; ester number 129.5; saponification number 135.49. Oil obtained from plants collected in 1951 had the following constants: D^{20} —0.9278; n_D^{18} —1.4695; acid number 2.02; ester number 30.51; saponification number 32.56; ester number after acetylation 93.76. The oil was found to contain 8.4% of bound alcohols and 17.4% of free alcohols. Its reaction to phenol was negative; reaction to carbonyl compound was positive; and the reaction to azulene-forming sesquiterpenes was negative.

According to P.S. Massagetov's (1947) analysis, aerial parts of the plant contain many alkaloids.

Series 4. Persicae Poljak.—Leaves thrice pinnately cut.

67. **A. persica** Boiss. Diagn. ser. I, 6 (1855) 91; Fl. or. III, 373; Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV, 685; Pampan. in Lavori Inst. bot. Univ. Cagliari, XL, 577.—*A. togusbulakensis* B. Fedtsch. in Tr. Bot. Muz. 1 (1902) 143; Fedtsch. Perech. Rast. Turk. IV, 197.

Perennial. Semishrub, 25–70 cm high, grayish-green from dense crisped hairs. Root woody, thick. Stem perennial, woody, thick, strongly reduced, branching from base, erect or ascending, covered with grayish-brown, cracking bark; flowering stems light greenish, erect, long, ribbed, leafy, simple or with more or less long, divergent or upright shoots. Lower and middle cauline leaves usually short-petiolate, 0.8–1.5 cm or more often 2.0–3.5(4.5) cm long (f. *hissarica* Poljak.), lamina round, thrice pinnately cut, terminal lobes narrow-lanceolately linear or linear, short acuminate or obtuse, upper cauline leaves sessile, smaller, and less divided. Capitula more or less remote, on short or long peduncles, in simple raceme or narrow panicle (f. *hissarica* Poljak.), hemispherical, 3–5 mm in dia. Involucral bracts densely hairy, outer bracts herbaceous,

lanceolate-linear, inner broadly ovate, herbaceous [sic.? carinate?] along midrib, with wide scarious margin. Receptacle convex, hairy or subglabrous. Peripheral florets pistillate, 10; their corollas narrowly tubular, with 2 teeth, punctate-glandular, glabrous, stigma lobes exerted from corolla tube, linear, obtuse, divergent, recurved; disk florets bisexual, numerous (30–40), their corollas narrowly cupshaped, glabrous or more often weakly hairy; anthers linear-lanceolate, apical appendages of anthers acute, basal appendages short, acute; style included in corolla tube, stigma lobes linear, erect. Achenes 1 mm long, oblong-conical, angular-ribbed, apically with flat areola, with uneven border. Flowering August. (Plate XXI, Fig. 2).

Rubbly slopes of mountains, sometimes on talus, gravel-beds, reaching 3,000 m and above.—*Soviet Central Asia*: Tien Shan (western part), Pamiro-Alai Region. *General distribution*: Iran, Indo-Himalayas, western Tibet. Described from Iran. Type in Geneva.

Economic Importance. According to the investigations of M.Kh. Khodzhinov and I.P. Tsukervanik (1948), the plants collected from the Chimgan District contained: about 12% α -pinene, about 16% camphors, about 23% camphene, about 33% l-borneol and l-bornylacetate. In the plants collected from the Bostandyk Region, according to the data of M.I. Goryaev, T.E. Serkibaeva, and L.A. Iganatova (1953), the yield of essential oil was 0.35% of the air-dried material. The oil was found to contain α -pinene—7.2%, borneol—18.3%, esters of borneol, mainly bornylcapronate—25.5%, camphene—14% and phenols—1.43%. According to the data of Goryaev and R.N. Sazonova (1959), this essential oil contains phenols, ketones, and azulene-forming sesquiterpenes.

Series 5. Hololeucae Poljak.—Plants caespitose, whitish from dense appressed arachnoid hairs.

68. **A. hololeuca** MB. ex Bess. in Nouv. Mém. Soc. Nat. Mosc. III (1834) 46; DC. Prodr. VI, 112; Ldb. Fl. Ross. II, 583; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, X, 85; Poljak. in Majevskii, Fl. 585.—Exs.: GRF No. 3167.

508 Perennial. Whole plant whitish from appressed arachnoid hairs. Root woody, thick, with short, perennial, woody, ascending, densely leafy shoots in upper part, loosely caespitose. Fertile shoots few, (5)20–30(35) cm high, ribbed, flexuous, ascending, weakly leafy, branched. Leaves of sterile shoots and lower cauline leaves long-petiolate, 2.5–6.0 cm long, ovate or oblong, twice pinnately cut, primary lobes 2–5 pairs, remote, secondary lobes 2–6 mm long and about 1 mm wide, oblong-linear, flat, scarcely acuminate, with sharply raised midrib and

thick margin; middle and some upper cauline leaves simple pinnate; uppermost bracteal leaves undivided, linear. Capitula in narrowly pyramidal panicle, on long peduncles, sometimes sessile, drooping, campanulate, 2.5–4.0 mm in dia. Involucral bracts whitish hairy, ovate or ovate-oblong, with scarious margin; outer bracts acute, shorter than inner subobtusely. Receptacle convex or flat, sometimes hairy. Peripheral florets pistillate, fewer (usually 4–6), their corollas narrowly tubular, punctate-glandular; stigma lobes exerted from [corolla] tube, linear, truncate, arcuate; disk florets bisexual, 20–24, their corollas conical, glabrous, punctate-glandular; anthers linear-lanceolate, apical appendages of anthers acute, basal appendages shorter, subobtusely; style long; stigma lobes linear, ciliate at apex, after flowering arcuate. Achenes to 1.5 mm, oblong ovate, somewhat flat, smooth, with flat round areola at apex, scarcely bordered. Flowering August.

Chalk outcrops, sometimes in river valleys on sand.—*European part*: Volga-Don, Middle Dnieper, Lower Don. Endemic. Described from the Voronezh and Kharkov regions. Type in Leningrad.

Series 6. Rupestres Poljak.—Plants caespitose; stems prostrate, ascending; leaves glabrous or weakly hairy beneath; terminal lobe cartilaginous, short-acuminate; receptacle hairy.

69. **A. rupestris** L. Sp. pl. (1753) 841; Ldb. Fl. Alt. IV, 67; Bess. in Bull. Soc. Nat. Mosc. IX, 20 (incl. var. v. *willdenoviana* Bess. and var. *thuringiaca* Bess. and var. *oelandica* Bess.); DC. Prodr. VI, 124; Ldb. Fl. Ross. II, 597; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 537; O. Fedtsch. Fl. Pam. 117; Kryl. Fl. Alt. III (1904) 652 p. p.; Fedtsch. Perech. Rast. Turk. IV, 201; Hegi, Ill. Fl. VI, 2, 656; Pampan. in Nouv. Giorn. bot. Ital. n. s. XXXIV (1927) 686; Kraschen. in Spisok Rast. Gerb. Fl. SSSR, X (1936) 88; Kraschen. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 362; Kryl. in Fl. Zap. Sib. XI, 2794.—*A. dentata* Willd. Sp. pl. III (1800) 1826.—*A. viridis* Willd. ibid. 1829.—Kryl. Fl. Zap. Sib. XI, 2794.—*A. viridifolia* Ldb. Ind. Sem. Horti
509 Dorpat. (1832) 2; Spreng. Syst. vet. III, 493; Ldb. op. cit. 597.—*A. rupestris* f. *salsuginea* Kryl. and f. *alpina* Kryl. op. cit. (1904) 652.—*Absinthium viridifolium rupestre* and *viride* Bess. in Bull. Soc. Nat. Mosc. VIII (1829) 246.—Exs.: GRF Nos. 1368, 3173a, b, c, 3295.

Perennial. Stems woody at base, more or less branched, prostrate or spreading developing few short, annual, densely leafy, basally ascending nonflowering shoots and besides, erect, brownish-violet, fertile, simple shoots, 20–50 cm or 10–25 cm high (var. *viridis* DC.), more or less densely hairy in upper parts. Leaves green, glabrous or with scattered (var. *viridis* DC.), usually bifid hairs; lowermost leaves

petiolate, others sessile, 1.5–5.0 cm long and 1.0–2.5 cm wide, twice pinnately cut, lower lobes rather small, undivided, middle and upper ternate or pinnately cut, terminal lobes lanceolate-linear or with cartilaginous, short-acuminate apex, 1–6 mm long and 0.5–1.0 mm wide, upper bracteal leaves simple pinnate. Capitula globose, 4–7 mm in dia, inclined or drooping, in narrowly racemose-spicate inflorescence. Involucre more or less hairy; outer involucre bracts oblong-linear, sometimes pinnately divided, inner bracts somewhat shorter, elliptical, with scarious margin. General receptacle convex, hemispherical, with floral hairs. Peripheral florets pistillate, 16, their corollas narrowly tubular, punctate-glandular, stigma lobes somewhat exserted from tube, linear, obtuse, after flowering somewhat recurved or divergent; disk florets bisexual, numerous (to 66); their corollas conical, glabrous, punctate-glandular; anthers as long as filaments, oblong-linear, apical appendages of anthers narrowly linear, roundish, basal appendages short, subacute, style shorter than corolla; stigma lobes short, linear, ciliate. Achenes small, oblong-ovoid, finely sulcate, with flat areola at apex, scarcely broadened. Flowering August.

Steppe zone, saline and alkaline meadows, sometimes in nonsaline steppe meadows in deciduous forests, stony slopes and limestone outcrops.—*European part*: Baltic Region (Oesel[Saaremaa], Gapsal, Moon islands, eastern part of Estonia), Volga-Kama; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Anagara-Sayans, Dauria (basin of Barguzin River); *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region. *General distribution*: Atlantic Europe, Scandinavia (Gotland Island). Described from Gotland Island. Type in London.

Series 7. Obtusliobae Poljak.—Stems erect or partly ascending, branched; terminal lobes of leaves usually obtuse, round; receptacle hairy or glabrous.

70. **A. obtusiloba** Ldb. Fl. Alt. IV (1833) 68, 70 excl. β . *fruticulosa*; Bess. in Bull. Soc. Nat. Mosc. IX, 9; DC. Prodr. VI, 121; 510 Ldb. Fl. ross. II, 594; Kryl. Fl. Alt. III, 682; Kraschen. in Kryl. Fl. Zap. Sib. XI, 2792.—*A. glabella* Kar. and Kir. in Bull. Soc. Nat. Mosc. XIV (1841) 441; Ldb. Fl. Ross. II, 577; Kryl. Fl. Alt. III, 641; Fedtsch. Perech. Rast. Turk. III, 196; Kraschen. in Spisok Rast. Gerb. Fl. SSSR, XI, 44; Kryl. Fl. Zap. Sib. XI, 2793.—*Ic.*: Ldb. Ic. pl. Fl. Ross. V, tab. 465, 466.—*Exs.*: GRF No. 3281.

Perennial. Root thick, woody, with erect or ascending, branched, perennial, woody, short, sterile shoots and 30–40 cm high flowering shoots. Leaves bright green, punctate-glandular, densely pilose or subglabrous at beginning of vegetative growth, except lower leaves,

sessile, 6–20 mm long and 6–17 mm wide, with ternate or palmately parted auricles, lamina palmately or lyrate pinnate, lower lobes petiolate, undivided, upper closer to leaf apex, usually ternate or palmately cut, secondary lobes oblong-lanceolate or linear, spatulate; upper and bracteal leaves pinnately cut or simple, linear. Capitula globose, 2–3(4) mm in dia, pedunculate or sessile, inclined or drooping, in more or less narrowly paniculate inflorescence. Outer involucre bracts oblong, inner bracts wider, scarious along margin and often hairy. Receptacle convex, hemispherical, hairy or glabrous (var. *glabella* (Kar. and Kir.) Poljak). Peripheral florets pistillate, 12; their corollas narrowly tubular, stigma lobes exerted from tube, linear, divergent; disk florets bisexual, 20–24; their corollas conical, with occasional hairs at apex, sometimes lacking them, punctate-glandular, anthers linear, apical appendages of anthers narrowly linear, subacute, basal appendages shorter, acuminate, stigma lobes short, linear, obtuse, ciliate. Achenes to 0.8 mm long, oblong-conical, somewhat flat, brown, with roundish areola at apex. Flowering August.

Stony, desert-steppe slopes of [mud]volcanic cones and mountains.—*Western Siberia*: Irtysh (southeastern part), Altai (south); *Soviet Central Asia*: Lake Balkhash Region. *General distribution*: Mongolia (Mongolia Altai). Described from Katun River valley, near mouth of Chuya River. Type in Leningrad.

Series 8. Subviscosae Poljak.—Stems for most part erect; leaves somewhat sticky, their terminal lobes short-acuminate; receptacle hairy or glabrous.

71. *A. subviscosa*. Turcz. in Bull. Soc. Nat. Mosc. I (1838) 649, nomen; Bes. in Bull. Soc. Nat. Soc. Nat. Mosc. IX, 24; Ldb. Fl. Ross. II. 594; Turcz. Fl. baic.-dahur. II, 68; Maxim. in Bull. Acad. Sc. Pétersb. 513 VIII, 537; Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXIV, 705.—*A. capillifolia* Fisch. ex DC. Prodr. VI (1837) 122.—*Exs.*: GRF No. 1168.

Perennial. Whole plant, except lower part of stem more or less densely covered with appressed bifid hairs and punctate glands. Root thick, woody, with perennial, short, leafy, sterile shoots and numerous fertile shoots. Stems in lower part glabrous, brown, 25–35(45) cm high. Lower and, in part middle leaves petiolate, 1.5–2.3 cm long, twice pinnately cut, lobes fewer, ternate, terminal lobe linear, short-acuminate, 3–6 mm long and 0.4–0.8 mm wide; upper leaves sessile, bracteal, ternate, palmate or undivided, linear. Capitula subglobose, 3–4 mm in dia, on very short peduncles, inclined, approximate or somewhat remote, in narrowly racemose-paniculate or almost simple racemose inflorescence. Involucre bracts lanceolate, hairy; outer bracts



herbaceous, inner bracts slightly shorter, with narrow herbaceous spine and wide scarious border. Receptacle convex, hairy. Peripheral florets pistillate, 10; their corollas narrowly tubular, punctate-glandular, sometimes weakly hairy; stigma lobes exerted from tube, linear, obtuse, divergent; disk florets bisexual, 20–22; their corollas conical, glabrous, yellow or pinkish, punctate-glandular; anthers as long as filaments, linear, apical appendages of anthers subulate, basal, appendages short, subacute; stigma lobes short, linear, ciliate, divergent at apex after anthesis. Achenes about 1 mm long, oblong conical, somewhat flat, sulcate, with a round areola at apex, scarcely bordered. Flowering August.

Dry open slopes and plains.—Dauria (near Lake Baikal). Endemic. Described from Baikal. Type in Leningrad.

72. **A. martjanovii** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 407.—Exs.: GRF No. 1168, sub nom. *A. subviscosa* Turcz.

Perennial. Root thick, woody, with short, erect, sterile, leafy shoots and rather numerous flowering shoots, glabrous below, hairy above; stem 20–35 cm high. Leaves rugose-punctate, with bifid appressed hairs; lower leaves petiolate, withering early 1.5–2.5 cm long, twice pinnately cut, lobes few, ternate, terminal lobule linear, short-acuminate, 3–6 mm long and 0.2–0.5 mm wide; middle and upper leaves usually sessile, simple pinnately cut. Capitula subglobose, 4–5 mm in dia, on short peduncles, divergent or drooping, approximate or somewhat remote, in narrowly paniculate inflorescence. Involucral bracts more or less densely hairy, with wide scarious margin; outer bracts elliptical, inner bracts ovate. Receptacle glabrous. Florets mostly fertile; peripheral florets pistillate, 10, their corollas narrowly tubular, in lower part slightly enlarged, punctate-glandular; stigma lobes half exerted from tube, linear, obtuse, somewhat spreading; disk florets bisexual, numerous (to 45), corolla conical, glabrous; anthers linear, apical appendages of anthers acute, basal appendages short, subacute; stigma lobes short, linear, after anthesis strongly recurved. Flowering August.

Stony slopes of lower mountains and sandy soils in steppes.—*Eastern Siberia*: Angara-Sayans (Minusinsk District). Endemic. Described from vicinity of Minusinsk. Type in Leningrad.

Note. The species is similar to *A. subviscosa* Turcz. but differs from it by the glabrous peduncles, large involucre, and large number of florets.

73. **A. altaiensis** Krasch. in Kryl. Fl. Zap. Sib. XI (1949) 2792.—*A. obtusiloba* β . *fruticosa* Ldb. Fl. Alt. IV (1833) 69; DC. Prodr. VI, 121, Ldb. Fl. Ross. II, 594.—*A. obtusiloba* Kryl. Fl. Alt. III (1904) 682, partim. non Ldb.—**lc.**: Ldb. Icones pl. Fl. Ross. V, tab. 466.

Plant moderately hairy with bifid appressed hairs; root 0.4–2.5 cm thick, at collar woody, many-headed, bearing perennial, woody, more or less strongly and irregularly branched and spreading, short shoots; fertile shoots numerous, 5–20 cm high, erect. Leaves bright green, punctate-glandular besides, long, bifid hairs on young leaves, later subglabrous, except lower leaves, sessile, 6–20 mm long and 4–12 mm wide, pinnately or palmately parted, lower lobes smaller and undivided; upper lobes larger, ternate or digitately divided into lanceolate, scarcely acute secondary lobes 1.5–3.0 mm long and 0.5–1.5 mm wide; upper and bracteal leaves less divided, with undivided lobes. Capitula globose, 4–6 mm in dia, crowded, partly remote, spreading or almost drooping, in simple raceme or in dense racemose panicle. Involucre hairy; outer involucre bracts oblong or sublanceolate, as long as elliptical inner bracts, scarious on margin. Receptacle hairy. Peripheral florets pistillate, 15, their corollas narrowly tubular, enlarged at base, punctate-glandular; stigma lobes exserted from [corolla] tube, linear, obtuse, erect, or curved; disk florets bisexual, numerous (to 50), their corollas conical, reddish in upper part, punctate-glandular, glabrous or weakly hairy; anthers oblong-lanceolate, apical appendages of anthers attenuate, acute, basal appendages shorter, subobtuse; stigma lobes linear, apically enlarged, obtuse, ciliate, after anthesis exserted from tube, arcuate. Achenes 1.2–1.5 mm long, oblong-pyriform or ovoid, glabrous, with filiform longitudinal ribs, with a flat round areola at apex. Flowering July to August.

- 515 Rubby desert-steppe slopes of mountains, sometimes on ancient moraines, on clayey, alkali soils of plains.—*Western Siberia*: Altai (southeast). *General distribution*: Western Mongolia (Mongolian Altai). Described from Altai. Type in Leningrad.

Series 9. Frigidæ Rydb. North. Am. Fl. 34, part 3 (1916) 258.—Annuals, biennials or perennials, herbaceous, more or less densely white-hairy, less often subglabrous; capitula usually hemispherical or globose, sometimes broadly campanulate; receptacle hairy or glabrous.

74. **A. absinthium** L. Sp. pl. (1753) 848; MB. Fl. taur.-cauc. I, 297; Ldb. Fl. Alt. IV, 62; DC. Prodr. VI, 125; Ldb. Fl. Ross. II, 598; Hook. Fl. Br. Ind. III, 328; Boiss. Fl. or. III, 373; Kryl. Fl. Alt. III, 655; Fedtsch. Perech. Rast. Turk. IV, 202; Rydb. op. cit. 258; Hall and Clements. Artem. 106; Pampan. in Nouv. Giorn. Bot. Ital. n. s. XXXIV, 635; Hegi, Ill. VI, 2, 651; Grossh. Fl. Kavk. IV, 139; Kraschen. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 363; Kraschen. in Kryl. Fl. Zap. Sib. XI, 2817; Poljak. in Majeovski, Fl. 586.—*Absinthium vulgare* Lam. Fl. franc. II (1778) 45; Bess. in Bull. Soc. Nat. Mosc. VIII

(1829) 259.—*A. bipetala* Gilib. Fl. lithuan. II (1782) 174.—Exs.: GRF No. 3170.

Perennial. Whole plant grayish from short approximate hairs, sericeous-tomentose. Root vertical, thick, perennial. Stem 60–100 cm high, herbaceous, erect, with short branches, leafy, sometimes basally with short nonflowering branches bearing long-petiolate leaves. Leaves with 6–9 cm long and 3–7 cm wide lamina broadly ovate, almost thrice pinnately dissected, terminal lobe lanceolate, short-acuminate; middle cauline leaves short petiolate, lacking lobes at base of petiole, twice pinnately dissected; upper leaves sessile, simple pinnate or twice ternate; bracteal leaves ternate or simple, undivided, narrowly lanceolate; lobes of all leaves linear-oblong, scarcely acuminate, undivided or with few teeth, usually 3–20 mm long and 1–4 mm wide. Capitula globose, 2.5–3.5 mm in dia, drooping or spreading into narrowly paniculate inflorescence. Involucral bracts oblong-ovate, [outer] almost as long as inner bracts, hairy on spine, with wide scarious margin. Receptacle convex, hairy. Peripheral florets pistillate, usually 25, their corollas filiform-tubular; stigma lobes exerted from tube, linear, arcuate; disk florets numerous (usually 60), their corollas conical, glabrous, sometimes weakly hairy; anthers linear, apical appendages of anthers obtusely angular, with round apex, basal appendages short, obtuse; stigma lobes broadly linear, after flowering somewhat curved. Achenes about 1 mm long, oblong-cuneate, rather flat, finely sulcate, with a round, slightly convex areole at apex. Flowering July to August.

516 Weed, on recent fallow lands, near roads, dwellings, in kitchen gardens and gardens, less often in crop fields, meadows, pastures and forest edge; in forest, forest-steppe and steppe zones, as well as in mountains.—*European part*: Karelia-Lapland, Dvina-Pechora, Ladoga-Ilmen, Baltic Region, Upper Dnieper, Upper Volga, Volga-Kama, Trans-Volga, Volga-Don, Upper Dnieper, Middle Dnieper, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus*: Ciscaucasia, Dagestan, Eastern, Western, and Southern Transcaucasia, Talysh; *Western Siberia*: Upper Tobol, Irtysh, Ob River Area, Altai; *Eastern Siberia*: Angara-Sayans; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan, Syr-Darya, Pamiro-Alai Region, mountainous Turkmenia. *General distribution*: Scandinavia (except the north), Central Europe, Atlantic Europe, western Mediterranean Region (excluding Italy), eastern Mediterranean Region, Balkans-Asia Minor, Armenia and Kurdistan, Iran-Afghanistan, Indo-Himalayas, northern Africa, North America. Described from Western Europe. Type in London.

Note. *A. absinthium* L. is mostly propagated through seeds, but it also has a highly developed capability for vegetative reproduction. In

the first year of the plant's life, adventitious buds develop on the root collar, which in the second year produce shoots that bear fruits already in the third year (age of the mother plant). When separated from the mother plant these are capable of producing normally developed plants identical with the mother plant, producing a large quantity of seeds every year and, in turn, developing buds. Common wormwood is not a troublesome weed, as it is very rare in standing crops; in the case of a significant presence, it can easily be eradicated by simply uprooting the plants, because its adventitious buds, as mentioned above, are found on the root collar.

Sometimes this wormwood occurs extensively in the hay meadows and pastures, significantly lowering the fodder value of the holdings, since, eaten by the cattle even in small quantity, it imparts a bitter taste and wormwood smell to the milk and milk products (I.P. Petrov, *Selskoe Khozyaistvo i Lessovodstvo* [Agriculture and Forestry], (1902).

Economic Importance. According to different published reports (M.I. Goryaev, 1953), essential oil of American origin contains 11.6–24.5% thujyl alcohol, thujone, phellandrene, and pinene; 24–1–36.2% thujylacetate and cadinene; 0.25% acetic, isovaleric, and palmitic acids; Italian oil contains 10% α - and β -thujone, thujyl alcohol, and its esters of acetic, isovaleric, and palmitic acids. According to the data of Kazakevich and Sobolevskaya, the oil contains a significant quantity of paraffin in addition to phallandrene and cadinene. The essential oil of *A. absinthium* L. is used in the liqueur-vodka industry for making vodkas and liqueurs, absinthe and vermouth and, in some European countries, for making beer (Hall and Clements, 1923). According to the investigations conducted by Troitsky (1950), the aerial part of the plant contains a rather significant quantity of carotene; according to Lazurevsky and Sadykov (1945), alkaloids were absent or found only in traces (Bankovsky et al.). Common wormwood contains a significant
517 amount of protein (15.6%) and, at the same time, also a rather considerable quantity of cellulose (34.1%). Domestic animals do not graze it; beginning in spring or during a shortage of fodder only the leaves and inflorescence are eaten. When cows graze on wormwood, the milk, as stated before, becomes bitter (Parashchuk, 1932). According to the observations of Zvonnikov (1936), wormwood hay is greatly relished by rabbits.

Its decoctions and infusions have been used in folk medicine since ancient times. Even now, they are very often used in the treatment of rheumatism, stomach disorders, malaria, for improving the appetite, etc. (Belyaeva, 1946).

75. *A. sieversiana* Willd. Sp. pl. III, 3 (1804) 1845; Ldb. Fl. Alt. IV, 61; DC. Prodr. VI, 126; Ldb. Fl. Ross. II, 599; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 537; Hooker. Fl. Br. Ind. III, 329; Kryl. Fl. Alt. III, 656, excl. var. β .; Kom. Fl. Manchzh. III, 679; Nakai, Fl. Korean. II (1911) 29; Fedtsch. Perech. Rast. Turk. IV, 204; Pampan. in Nuov. Giron. Bot. Ital. n. s. XXXIV, 700; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1032; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 362; Pampan. in Lavori Inst. bot. Univ. Cagliari, XL, 570; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2818; Poljak. in Majeovski, Fl. 586—*Absinthium sieversianum* Bess. in Bull. Soc. Nat. Mosc. VIII (1829) 259.—Exs.: GRF No. 3169a, b, c.

Annuals, biennials. Whole plant grayish or whitish from densely appressed hairs. Root vertical, slender. Stem 30–100 cm high, erect, strongly ribbed, branched. Leaves punctate-glandular; lower and middle cauline leaves long-petiolate, 1.5–12.0 cm and even longer; lamina broadly triangular, thrice or twice pinnately dissected into oblong or linear-oblong, obtuse or round, 2–10 mm long and 0.5–12.0 mm wide, secondary lobes upper and bracteal leaves sessile, less divided, uppermost undivided, linear. Capitula numerous, hemispherical 4–6 mm in dia, drooping, in rather wide, paniculate inflorescence. Outer involucre bracts hairy, linear-oblong, inner bracts elliptical or almost round, with wide scarious margin. Receptacle convex, hemispherical, hairy. Peripheral florets pistillate, 18, their corollas narrowly tubular, gradually enlarged toward base, punctate-glandular; stigma lobes exserted from tube, narrowly linear, obtuse, straight, weakly spreading; disk florets bisexual, numerous (about 100), their corollas conical, glabrous, anthers oblong-lanceolate, apical appendages of anthers long, almost subulate, basal appendages subacute; stigma lobes exserted from tube after anthesis, ciliate at apex, straight, later curved. Achenes ovoid, almost flat, slender, sulcate, with a round flat areola at apex. Flowering August.

Steppe and southern part of forest zone; steppe, alkaline and, less often, dry-valley meadows, open groves, sometimes along coastal slopes, often as weed near dwellings, roadsides, fields and fallow lands.—*European part*: Trans-Volga (introduced), Volga-Kama; *Western Siberia*: Upper Tobol, Ob River Area, Irtysh, Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria, Lena-Kolyma (Vilyui District); *Far East*: Zeya-Bureya, Uda River Area, Ussuri; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region. *General distribution*: Himalayas (Kashmir), Western Tibet, China, Mongolia, Japan. Described from Siberia. Type in Berlin.

Note. Siever's wormwood is widely distributed in the steppe and forest-steppe zones of Siberia and in the southern regions of the forest zone. It is a common plant of fallow lands of the chernozem steppes, where it does not avoid even alkaline soils. At the same time, it is a common weedy plant of crops, where it grows especially luxuriantly in dry years; it is also ruderal, constantly found by roadsides, near dwellings, at the edges of fields, etc. Under fallow conditions, it often dominates the plant cover in the second and even third year, when it appears to form almost a pure herb cover. Later, as the arable layer of the soil becomes compact, this wormwood is replaced by rhizomatous grasses. It is rarely found on old fallow lands. Siever's wormwood, normally an annual or a biennial weed, can be fully eradicated by usual agronomic measures (fall plowing, early fallow). In the opinion of animal husbandry specialists (*Tr. Omsk. Inst. Moloch. Khoz.*, 1, II 1931–1933), this wormwood can be used also as a highly nutritive fodder, particularly suitable for making silage. However, because of the bitterness inherent in wormwoods, it is recommended that, as a feed for milk cows, it be mixed with other fodders (I.V. Larin, 1956).

Economic Importance. Siever's wormwood contains 0.02 to 0.4% essential oil. According to G.V. Pigulevsky and G.P. Berezovsky (1949), the constants of the oil are: D_{20}^{20} —0.9072; D_4^{20} —0.9056, n_D^{20} —1.4845; acid number—1.04; ester number—38.23; alcohols—24%; ketones—12%; phenols—12%. The oil contains α -pinene (highly recemated*), cineole—13.8%, myrcene—10.89%; alcohols, in all probability, are tertiary, the total quantity of them is 24%; of phenols 12%, of ketones of unknown nature 12%, and of azulene-traces; sesquiterpenic carbohydrates and alcohols have not been investigated in detail.

76. *A. macrocephala* Jacq. Cat. (1833) No. 2000; Bess. in Bull. Soc. Nat. Mosc. IX (1836) 28; DC. Prodr. VI, 125; Hook. Fl. Br. Ind. III, 329; O. Fedtsch. Fl. Pam. 117; Fedtsch. Perech. Rast. Turk. IV, 204; Pampan. in Lavori Inst. bot. Univ. Cagliari, XL, 570; Krascheninn. in Kryl. Fl. Zap. Sib. XI 2820; Grub. Konsp. Fl. Mong. 266.—*A. griffithiana* Boiss. Fl. or. III (1875) 376.—*A. sieversiana* var. *pygmaea* Kryl. Fl. Alt. III (1904) 656.—*A. akbaitalensis* O. Fedtsch. Second Addendum to Fl. Pam. (1905) No. 88.—*A. krytoviana* Steinb. (nom.) in Prokhor. and Lebed. Dush. Rast. Alt. (1932) 15.—*Pyrethrum pamiricum* O. Fedtsch. in Tr. Peterb. Bot. Sada, XXI (1903) 345.—Exs.: GRF No. 3296.

*Optically highly inactive—General Editor.

Annual. Whole plant more or less covered with dense, white, appressed hairs; root slender, vertical bearing solitary or numerous, simple or sometimes branched (at base), 6–20(30) cm high stems. Lower and middle cauline leaves petiolate, 1.5–4.0 cm long and 1–2 cm wide; lamina broadly ovate to oblong-ovate, twice pinnately cut, with 2 pairs of lobes, lobes ternately divided or pinnately cut, secondary lobes oblong-linear or linear-spatulate, obtuse or round, 1–4 mm long; upper leaves smaller, subsessile, simple pinnate, bracteal leaves entire, linear. Capitula hemispherical, 4–10 mm in dia, on more or less long peduncles in lax racemes in upper half of stem and branches. Outer involucrel bracts herbaceous, linear, densely hairy, inner bracts oblong-ovate or elliptical, with narrow, herbaceous spine and wide whitish scarious margin, subglabrous. Receptacle convex, hemispherical, hairy. Peripheral florets many-rowed, pistillate, numerous (to 70), their corollas narrowly tubular, enlarged toward base, punctate-glandular; stigma lobes scarcely exerted from tube, linear; disk florets bisexual, numerous (about 90), their corollas narrowly cup-shaped-conical, glabrous, punctate-glandular; anthers on short filaments, oblong-lanceolate, apical appendages of anthers long, acute, basal appendages short, round; stigma lobes broadly linear, ciliate, after flowering divergent. Achenes to 1.2 mm long, ovate-oblong, finely sulcate, apically with flat, weakly bordered areola. Flowering August.

Gravelly, clayey and rubbly places at high-altitude or alpine zone of mountains, sometimes descending considerably lower along streams.—*Western Siberia*: Altai (Chuya “belki”*); *Soviet Central Asia*: Tien-Shan, Pamiro-Alai Region. *General distribution*: Mongolia, Iran Region (Afghanistan), Tibet, Himalayas. Described from Himalayas. Type in Paris.

Economic Importance. According to Prokhorova and Lebedev (1932), the recovery of essential oil is 0.4–0.5%. The oil contains (M.A. Favorsky, 1935) 1- α -pinene—9%, cineole—12.1%, camphors—16.3%, azulene—6.5%; and 28.3%, apparently, of tertiary alcohol (possibly borneol).

According to the data of M.I. Goryaev, K.K. Kruglykhina and E.N. Sazhdarova (1959), the presence of alkaloids in the plant has been established.

77. **A. kulbadica** Boiss. and Buhse in Nouv. Mém. Soc. Nat. Mosc. XII (1860) 120; Boiss. Fl. or. III, 373.

Annual, biennial. Plant grayish from dense, appressed, short hairs; root vertical. Stem 80–120 cm high, herbaceous, erect, ribbed, leafy,

*Snow-covered flattened mountain summits in Siberia—General Editor.

branched. Leaves, especially beneath, with distinct veins; lower cauline leaves withering before flowering, petiolate, to 4 cm long, lamina broadly ovate, twice pinnately dissected, with 2–3 pairs of lobes, lobules 3–8 mm long and 1–2 mm wide, undivided or with 1–3 short teeth, 520 oblong-linear or lanceolate, obtuse or short-acuminate; middle and upper cauline leaves sessile or subsessile, pinnatisect or ternate, bracteal leaves simple, oblong-linear. Capitula globose, 3–4 mm in dia, pedunculate, drooping, usually remote, on long divergent branches, in wide, pyramidal, paniculate inflorescence. Involucral bracts punctate-glandular, brownish, scarious along margin, irregularly incised; outer bracts broadly cuneate, densely hairy, inner bracts larger, oblong-ovate or oblong, subglabrous. Receptacle with hairs. Peripheral florets pistillate (7–8), their corollas narrowly tubular, punctate-glandular, weakly hairy or glabrous; stigma lobes scarcely exserted from tube, linear, but most often disk florets bisexual, 32–40, their corollas conical, glabrous; anthers lanceolate-elliptical, apical appendages of anthers large, subacute, basal appendages short, obtuse; style shorter than tube; stigma lobes short, linear, short-ciliate, after anthesis divergent. Achenes to 2 mm long, oblong-ovoid or almost pyriform, somewhat flat, sulcate, apically with a plano-convex areola.

Mountain deserts and foothills along banks of streams, in ravines on slopes.—*Soviet Central Asia*: mountainous Turkmenia (western Kopetdag). *General distribution*: Northern Iran. Described from Caspian Coast. Type in Geneva; cotype in Leningrad.

78. **A. samoiedorum** Pampan. in Lavori Inst. bot. Univ. Cagliari, XXXV (1938) 2.—*A. anethifolia* Fisch. var. *macrocephala* F. Schmidt. in Mém. Acad. Sc. Pétersb. VII, XVIII, 1 (1872) 107.—**Exs.**: GRF No. 3297.

Annual. Plant herbaceous, more or less densely hairy; root slender, vertical. Stem 6–12–18(28) cm high, brownish-violet, branched from base, with more or less numerous, upright, arcuate branches. All leaves petiolate, simple pinnate or in part ternate, terminal lobe narrowly oblanceolate, round or short acuminate. Capitula at apices of stem and branches, solitary or many, in simple recemes, sessile or long pedunculate, divergent, somewhat plano-convex, round in cross section, 6–10 mm in dia. Involucral bracts oval, outer bracts densely hairy along narrow, linear, raised, herbaceous spine and with wide, irregularly incised, scarious, margin; inner bracts brownish completely scarious, weakly hairy. Receptacle convex, hemispherical, finely tuberculate, glabrous or hairy. Peripheral florets pistillate, 14–15; their corollas narrowly tubular, slightly enlarged toward base, glabrous, punctate-glandular; stigma lobes exserted from tube, narrowly linear, obtuse,

straight; disk florets bisexual, rather numerous (to 170); central florets sometimes not fully mature or undeveloped, their corollas conical, glabrous, punctate-glandular; anthers oblong-linear, apical appendages
 521 of anthers long, acute, basal appendages not developed; stigma lobes exserted from tube at maturity of achenes, linear, cilia at apex, curved. Achenes to 1.2 mm long, oblong-prismatic or fusiform, angular, sulcate. Flowering August.

Riverbanks, sands and gravel beds in tundra zone, partly in forest-tundra.—*Arctic*: Arctic Siberia (low-lying areas of Yenisei, Turukhansk), Anadyr, Chukotka (upper reaches of Anadyr River). Endemic. Described from Arctic Siberia. Type in Florence.

79. **A. succulenta** Ldb. Fl. Alt. IV (1838) 81; Bess. in Bull. Soc. Nat. Mosc. IX, 71; DC. Prodr. VI, 120; Ldb. Fl. ross. II, 593; Fedtsch. Pereh. Rast. Turk. IV, 201; Krascheninn. in Fl. Zap. Sib. XI, 2822.— *Ic.*: Ldb. Ic. pl. Fl. Ross. V, tab. 474.

Annual or biennial. Plant covered with variously dense, bifid and simple hairs, as well as capitate glandular hairs and simple glands. Root slender, fusiform, vertical. Stems single or few, 8 to 50–60 cm high, slender or thicker, erect or ascending, ribbed, simple or strongly branched. Leaves succulent, initially hairy, later glabrescent, strongly variable in size and degree of cutting; basal and lower cauline leaves withering early, 7–15 cm long, twice or thrice pinnately incised, lobes fewer, obliquely antrorse, lobules oblong, obtuse; middle and upper cauline leaves less large (2–4 cm long), twice pinnately incised, with narrower secondary lobes; upper bracteal leaves simple, linear, sometimes with auricles. Inflorescence in small specimens simple, racemose, with fewer capitula, paniculate in larger plants and with many capitula. Capitula hemispherical, 4–5 mm in dia, pedunculate, somewhat remote, drooping. Involucral bracts densely hairy and punctate-glandular; outer bracts small, lanceolate, raised along spine, with narrowly scarious margin; inner bracts larger, oval, widely scarious. Receptacle convex, tuberculate, glabrous. Peripheral florets pistillate, 16; their corollas narrowly tubular, punctate-glandular; stigma lobes exserted from corolla tube, linear, obtuse, divergent or recurved; disk florets numerous (to 75); their corollas conical, glabrous; anthers linear, apical appendages of anthers long, acute, basal appendages short, round; stigma lobes at maturity of achenes exserted from tube, linear, obtuse, arcuate. Achenes to 1.2 mm long, oblong, sulcate, apically with round, areola with border. Flowering August.

Saline [marshy] soils, [marshy] saline meadows, sometimes a weed in irrigated areas or trash dumps, in steppe and desert zones.—*Western Siberia*: Irtysh (southern Semipalatinsk); *Soviet Central Asia*:

Aralo-Caspian Region (Kyzyl-Orda, Aral Region), Kara-Kum (lower reaches of Amu-Darya). Endemic. Described from Kazakhstan. Type in Leningrad.

522 **Economic Importance.** According to the data of M.I. Goryaev, R.N. Sazonova and N.I. Bikanina (1951), the yield of essential oil was 0.52% from plants collected in the Kyzyl-Orda District. The liquid was viscous, bright yellow, with a strong bitter taste. The constants: D_{20}^{20} —0.9621; D_n^{20} —1.4772; acid number—4.6; ester number—37.56; saponification number—42.16. It does not dissolve in 70% alcohol, but in 80% alcohol it dissolves in the ratio of 1:1 and completely in 90% alcohol.

80. **A. jacutica** Drob. in Tr. Bot. Muz. Akad. Nauk SSSR, XII (1914) 108.—*A. sieversiana* var. *septentrionalis* Pamp. in Lavori Inst. bot. Univ. Cagliari, XXXV (1938) 3.—**lc.:** in Tr. Bot. Muz. Akad. Nauk SSSR, XII, 109, Fig. 2 and Plate XV.—**Exs.:** GRF No. 3298.

Annual or biennial. Whole plant grayish from dense white, appressed hairs. Root slender, vertical. Stems single or few, 25–40 cm high, erect or basally ascending, almost circular, sometimes strongly branched almost from base. Lower leaves long-petiolate, 2.0–4.5 cm long, lamina round or broadly ovate, twice or thrice pinnately incised, lobes 2 pairs, pinnati-, twice pinnately incised or ternate, terminal lobule narrowly linear, 0.5–1.0 mm wide, middle cauline leaves subsessile, upper ones much less divided, palmatipartite or ternate. Capitula hemispherical, 6–8 mm in dia, pedunculate, inclined or drooping, in broad, lax, paniculate inflorescence. Involucral bracts prolate, with narrow green spine and wide, whitish, scarious margin; outer bracts densely covered with white hairs, inner ones glabrous or subglabrous. Receptacle convex, glabrous or hairy. Peripheral florets pistillate (to 21); their corollas narrowly tubular, punctate-glandular; stigma lobes linear, exserted from tube, linear, obtuse, divergent; disk florets bisexual numerous (to 100), of which central florets often undeveloped; their corollas conical, punctate-glandular, anthers oblong-linear, on short filaments, apical appendages of anthers long, almost subulate, basal appendages very short, obtuse, stigma lobes linear, short-ciliate, exserted from corolla at maturity of achenes, arcuate. Achenes 1 mm long, oblong-ovoid or pyriform, somewhat flat, sulcate, with a round areola at apex. Flowering August.

Peat bogs, lake shores, old fields and weedy places.—*Eastern Siberia:* Angara-Sayans, Dauria, Lena-Kolyma. Endemic. Described from Yakutia. Type in Leningrad.

Series 10. Anethifoliae Poljak.—Plant usually densely hairy in beginning, later glabrous; leaves twice or thrice pinnately incised into filiform secondary lobes; capitula 2–4 mm in dia; receptacle with floral hairs or glabrous.

81. **A. anethifolia** Web. in Stechm. Artem. (1775) XXIX, No. XXV; Willd. Sp. pl. III, 1828; DC. Prodr. VI, 126; Ldb. Fl. Ross. II, 600; Turcz. Fl. baic.-dahur. II, 2, 207; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 537; Kryl. Fl. Alt. III, 657; Kom. Fl. Manchzh. III, 678; Pampan. in Nouv. Giron. Bot. Ital. n. s. XXXIV, 646.—*A. anethifolia stelleriana*, var. *erectiflora* and var. *multicaulis* DC. Prodr. VI (1837) 126.—*A. multicaulis* Ldb. Fl. Alt. IV (1833) 60; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2821.—*Absinthium divaricatum* Fisch. ex Bess. in Bull. Soc. Nat. Mosc. VIII (1829) 263.—*A. σ. multicaulis* Bess. in Bull. Soc. Nat. Mosc. IX (1836) 31.—*A. korotkyi* Krasch. in Spisok Rast. Gerb. Fl. SSSR, X (1936) 73.—**lc.**: Gmel. Fl. Sib. II, tab. LIV.—**Exs.**: GRF Nos. 3171a, b, 3151.

Annual or biennial. Root vertical, sometimes thicker. Stems solitary or numerous, 20–35 (45) cm or 3–10 cm high (var. *korotkyi* (Krasch.) Poljak.), erect or decumbent, ribbed, glabrous, brownish-violet, strongly branched, sometimes almost from base. Leaves whitish-woolly, later glabrous; basal leaves withering early, long-petiolate, to 3.0–4.5 cm long, twice or thrice pinnately incised, terminal lobes linear-filiform, subobtuse, 3–8 mm long; middle cauline leaves short-petiolate or sessile, less divided; uppermost leaves bracteal, simple, linear-filiform. Capitula broadly campanulate, 2–4 mm in dia, more or less on long, filiform peduncles, drooping, somewhat remote, in lax paniculate inflorescence. Involucral bracts whitish-hairy or subglabrous; outer bracts small, lanceolate, herbaceous, inner bracts oval, with wide scarious margin. Receptacle convex, hemispherical, with floral hairs or glabrous (var. *korotkyi* (Krasch.) Poljak.). Peripheral florets pistillate few (3–6), their corollas narrowly tubular, punctate glandular; stigma lobes narrowly linear, obtuse, straight or slightly divergent; disk florets bisexual (to 18), their corollas conical, punctate-glandular, usually purple-pink, glabrous, less often yellow (f. *multicaulis* DC.); anthers linear, apical appendages of anthers long, subulate, basal appendages of anthers short, subobtuse; stigma lobes linear, dilated, ciliate, weakly divergent. Achenes to 1.5 mm long, oblong-conical, somewhat flat, brown, apically with a round areola, strongly bordered. Flowering August. (Plate XXVII, Fig. 2).

Valleys of rivers and lakes in salt marshes, alkali soils, sands in steppe or desert-steppe zones and in mountains.—*Western Siberia*: Altai (Chuya Steppe); *Eastern Siberia*: Angara-Sayans, Dauria. *General*

distribution: Mongolia. Described from Steller's specimen from the salt marshes near Lake Baikal. Type in Leningrad.

Note. *A. multicaulis* Ldb. is a variety of *A. anethifolia* Web., which is distinguished by the color of the corolla of the disk florets. Likewise, recognition of *A. korotkyi* Krasch. is not justified, since it is a form distinguished only by its short height and the absence of hairs on the receptacle, i.e., by characters of no taxonomic significance.

- 524 **Section 5. Artanacetum** (Rzazade) Poljak. emend. comb. nov.—*Artanacetum* Rzazade in Izv. Akad. Nauk. Azerb. SSR (1957) 3, pro gen.—Capitula in fasciculate corymb at apices of branches; involucre many-rowed, imbricate, outer involucre bracts small, round, inner bracts considerably larger, oval; receptacle narrow, cylindrical-conical, glabrous; achenes oblong-prismatic.

82. **A. incana** (L.) Druce in Rept. Bot. exch. Cl. Brit. Isles, III (1914) 414.—*Tanacetum incanum* L. Sp. pl. (1753) 844.—*T. orientale* Willd. Sp. pl. III (1804) 1812.—*T. canescens* DC. Prodr. VI (1835) 129.—*Artemisia orientalis* Willd. loc. cit.; Grossh. Fl. Kavk. III, 143.—*A. fasciculata* MV. Fl. taur.-cauc. II (1808) 293; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 62; DC. Prodr. VI, 116; Ldb. Fl. Ross. II, 587; Boiss. Fl. or. III, 368; Grossh. op. cit. III, 142.—*A. fasciculata* var. *iberica* and var. *armeniaca* Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 63, 64.—*Artanacetum fasciculatum* (MB) Rzazade in Izv. Akad. Nauk. Azerb. SSR (1957) 3.—Exs.: GRF No. 3168a, b; Herb. Fl. Cauc. No. 497.

Perennial. Whole plant whitish from dense, silky appressed hairs. Root thick, woody, with perennial, woody, more or less branched, sterile shoots covered with brownish gray bark. Flowering shoots many, erect, (20)25–40 cm high, finely branched in upper part, with long, straight, divergent branches. Lower and middle leaves petiolate, 1.0–2.5 cm long and 0.8–1.7 cm wide, their laminae broadly round, pinnately or ternately palmate lobes petiolulate, pinnate, palmate, or ternate, terminal lobules lanceolate or linear-lanceolate, scarcely acuminate, sometimes round, 2–6 mm long; upper leaves sessile, more often palmately cut or ternate, bracteal leaves mostly simple, lanceolate-linear. Capitula ovate-conical, to 4 mm long, pedunculate, upright, partly drooping, in dense fasciculate corymbs, at apices of more or less divergent branches forming racemose-paniculate inflorescence. Involucre conical, many-rowed imbricate; outer involucre bracts small, round; inner considerably larger, oval, hairy along spine, glabrous in remaining part, smooth, with wide, unevenly scarious margin. Receptacle convex, narrow, cylindrical-conical, glabrous. Peripheral

florets pistillate, few; their corollas narrowly tubular, enlarged at base, with 2 teeth, punctate-glandular and with sparse hairs; stigma lobes projecting, linear, truncate, divergent; disk florets 9–12, bisexual; their corollas narrowly conical, with 5 teeth, with white, long, erect hairs on teeth, glabrous and punctate-glandular in remaining part; anthers exceeding tube, linear-lanceolate, apical and basal appendages of anthers acute; stigma lobes linear, arcuate after flowering, with dense straight cilia at apex. Achenes up to 1.5 mm long and 0.4–0.5 mm thick, dark brown, oblong-prismatic, angular, with flat, round apex, bordered on one side. Flowering August.

Stony slopes of mountains.—*Caucasus*: Eastern and Southern Transcaucasia, Dagestan. Endemic. Described from Georgia (Kura River). Type in Leningrad.

Subgenus 2. Dracunculus Bess. sect. in Bull. Soc. Nat. Mosc. VIII (1835) 16.—*Oligosporus* Cass. in Bull. philom (1817) 33 and Dict. Nat. XXXVI (1826) 25.—Capitula smaller, ovate or globose, sessile or pedunculate, in spicate, racemose or paniculate, less often in dense capitate inflorescence. Involucral bracts in 2–3 rows, oval, round, or oblong-lanceolate, herbaceous along spine, glabrous or hairy, with more or less wide scarious margin, usually not incised-toothed, uniformly long but outer involucral bracts smaller than inner bracts. Receptacle flat or somewhat convex. Peripheral florets pistillate, always fertile; their corollas tubular or narrowly conical, often slightly enlarged at base, with 2–3 teeth, glabrous, stigma lobes 2, less often 3, narrowly linear, subacute or obtuse; pollen-receptive area as continuous strip bordering margin of lobe. Achenes small, pyriform, ovoid or oblong, somewhat flat, narrowed at base, very finely ribbed brown; pappus absent; disk florets staminate but with rudiment of pistil, few or rather numerous; their corollas usually narrowly campanulate, with 5 acute, straight, yellow or pinkish teeth, glabrous or hairy in upper part; anthers linear, apical appendages of anthers obtuse or acute, basal appendages smaller, subobtuse, weakly developed, “antheropodia” well-developed, usually convex, their pistils abortive as style (lacking ovary), with undivided funnel- or goblet-shaped, densely ciliate stigma, less often stigma with 2 short, erect, basally connate lobes.

Annual and shrub-like or herbaceous plants with simple, less often branched (stellate) hairs or glabrous; leaves simple, linear and narrowly lanceolate or pinnately cut, twice pinnately cut or pinnately divided. The subgenus includes about 80 species distributed in the extratropical region of Asia to the extreme north, as well as in Europe, northern Africa, and North America.

1. All or almost all leaves simple, linear-lanceolate or narrowly lanceolate, less often some leaves with 2–5 lobes or 3 lobed at apex 2.
- + Lower and middle cauline leaves simple to twice pinnately incised or pinnatifid 8.
2. Leaves gray from more or less dense pubescence of bifid hairs 87. **A. glauca** Pall.
- + Leaves mainly yellowish-green, glabrous, less often pubescent with simple or bifid hairs, but not gray 3.
- 526 3. Shrub-like perennial, 60–90 cm high, strongly woody at base; flowering shoots strongly branched. Plants of sandy deserts of Soviet Central Asia 4.
- + Perennials with herbaceous stems, sometimes weakly woody only at base, more weakly branched. Mainly steppe, meadow, or halophytic plants 5.
4. All leaves simple, lanceolate-linear, with short appressed hairs; involucre densely hairy 88. **A. dimoana** M. Pop.
- + Leaves mainly glabrous, narrowly linear, sometimes with 2–5 lobes in upper part, involucre glabrous 89. **A. kelleri** Krasch.
5. All or most leaves more or less deeply 3-lobed at apex 85. **A. dracunculiformis** Krasch.
- + All leaves entire, very rarely some with short teeth 6.
6. Leaves usually rather densely hairy beneath with simple appressed hairs. Plants of Caucasus. 86. **A. daghestanica** Krasch. and Por.
- + Leaves glabrous or more weakly hairy 7.
7. Stem brownish or violet-brownish; inflorescence more or less narrow, dense panicle. 84. **A. pamirica** Winkl.
- + Stem stramineous; inflorescence more or less spreading or narrow pyramidal panicle. 83. **A. dracunculus** L.
- 8(1). Annuals or biennials, mostly with solitary stem and more slender vertical root. 9.
- + Perennials or semishrubs. 12.
9. Plants 5–20 cm high; leaves small, mostly 0.6–1.8 cm long; peripheral florets pistillate, 15–18, central florets 5–6 116. **A. demissa** Krasch.
- + Plant larger, with longer leaves; capitula with fewer florets. 10.
10. Lobes of middle and upper cauline leaves narrowly linear; stem reddish-brown. 115. **A. scoparia** W. and K.
- + All leaves except lowermost divided into filiform-linear lobes; stem stramineous or brownish. 11.

11. Plants glabrous; lobes of middle cauline leaves 8–12 mm long. ... 104. **A. capillaris** Thunb.
 + Plants appressed-hairy; lobes of leaves 3–5 mm long 115. **A. scoparia** var. **scoparioides** Poljak.
- 12(8). Leaves of sterile shoots or all, or at least some lower cauline, leaves oblong-cuneate, toothed or lobed 13.
 527 + Lower leaves pinnately cut, twice or almost thrice pinnately incised or pinnately divided 15.
13. Inflorescence spreading panicle, with straight, long more or less strongly divergent branches 100. **A. japonica** Thunb.
 + Panicle narrow, dense, with short branches appressed to inflorescence axis or branches weakly divergent 14.
14. Leaves of sterile shoots and partly lowermost cauline leaves obtuse, toothed, but middle and partly upper cauline leaves pinnately incised; plant glabrous 102. **A. desertorum** Spreng.
 + Leaves mostly obtuse, toothed or toothed-lobate; plant more or less pubescent in upper part. 101. **A. littoricola** Kitam.
- 15(12). Plant densely caespitose, pulvinate; stem 1–3 cm high; capitula in dense capitate inflorescence. 112. **A. henriettae** Krasch.
 + Plants taller; capitula in other type of inflorescence 16.
16. Semishrubs (shrub-like perennials) 17.
 + Herbaceous perennials 23.
17. Involucres always, but leaves and stem mostly densely appressed hairy 18.
 + Plants glabrous or more weakly hairy only in beginning of vegetative growth; involucres glabrous 19.
18. Lower cauline leaves 5–8 cm long, divided into narrowly linear, 0.7–2.7 cm long and 1–2 mm wide lobes; capitula ovate, sessile, crowded on branches 90. **A. trautvetteriana** Bess.
 + Lower leaves 3–5 cm long, divided into narrowly linear, 5–10(15) mm long and 1 mm wide lobes; capitula subglobose, pedunculate, remote 93. **A. quinqueloba** Trautv.
19. Capitula subglobose, 1.5–2.0 mm wide and as long, on almost horizontal divergent branches in broad, subglobose, lax inflorescence; plants more or less ephemeral, drying out at beginning of July 97. **A. songarica** Schrenk.
 + Capitula larger, ovoid; inflorescence of other types 20.
20. Inflorescence narrow, dense panicle or raceme 21.
 + Capitula in more or less lax racemose-paniculate inflorescence 22.
21. Capitula 2.5–3.5 mm long, in racemose inflorescence; lower leaves 2.0–3.5 cm long, pinnately cut; plant glabrous or sometimes with occasional stellate hairs 91. **A. salsoloides** Willd.

- + Capitula 4–5 mm long, in paniculate inflorescence; lower leaves 3–6 cm long, once or twice pinnately cut; plant with simple hairs or glabrous 92. **A. halodendron** Turcz. ex Bess.
- 528 22. Lower cauline leaves 2–5(6) cm long, twice pinnately cut, their lobes 5–15 mm long 95. **A. arenaria** DC.
- + Leaves 5–8 cm long, pinnately cut, their lobes to 3–4 cm long ...
..... 95. **A. albicerata** Krasch.
- 23(16). Capitula subglobose or broadly ovate 24.
- + Capitula ovate or narrowly ovate 32.
- 24. Leaves usually glabrous 25.
- + Leaves more or less densely hairy 27.
- 25. Lobes narrowly linear or filiform-linear, to 7–16 mm long
..... 103. **A. macilenta** (Maxim.) Krasch.
- + Lobes linear or lanceolate-linear, mostly to 7 mm long 26.
- 26. Capitula 4–5 mm long 113. **A. limosa** Koidz.
- + Capitula 2–3 mm long
..... 105. **A. commutata** Bess. var. **dolosa** Krasch.
- 27. Capitula in narrow, racemose, partly racemose-paniculate inflorescence 28.
- + Capitula in paniculate inflorescence 30.
- 28. Capitula small, 2.5–3.0 mm in dia 114. **A. pycnorhiza** Ldb.
- + Capitula 3–4 mm in dia 29.
- 29. Leaves hairy, twice or almost thrice pinnately incised; involucre bracts and central florets usually hairy 111. **A. borealis** Pall.
- + Leaves glabrous or hairy, pinnately cut or almost twice pinnately incised; florets and involucre usually glabrous
..... 134. **A. pycnorhiza** Ldb. var. **depauperata** Krasch.
- 30. Plant green, moderately hairy; capitula small, to 2 mm in dia
..... 105. **A. commutata** Bess. var. **pubescens** Ldb.
- + Plant whitish from dense semidivergent hairs; capitula larger
..... 31.
- 31. Lower cauline leaves twice pinnately incised; capitula 3–4 mm in dia, 109. **A. ledebouriana** Bess.
- + Leaves spatulate-pinnately divided; lobes undivided or partly pinnately divided; capitula 2–3 mm in dia
..... 110. **A. pannosa** Krasch.
- 32(23). Leaves palmately divided into 4–7 parts 33.
- + Leaves more compound 34.
- 33. Stems 34–40 cm high, branched; lower cauline leaves 3–5 cm long; inflorescence narrow panicle 98. **A. lipskyi** Poljak.
- + Stems 5–12(15) cm high, usually simple or with short branches; leaves 1–3 cm long; inflorescence narrow, racemose-paniculate.
..... 99. **A. kuschakewiczii** Winkl.

34. Capitula in simple racemes in upper part of stem, on short branches below 96. **A. saposhnikovii** Krasch. ex Poljak.
 + Inflorescence paniculate 35.
35. Capitula 3.0–4.5 mm long, in dense narrow panicle; plants glabrous or subglabrous 36.
 + Capitula 2.0–2.5(3.0) mm long, in more or less spreading, less often somewhat narrow panicle; plants mostly pubescent, sometimes glabrous 37.
36. Capitula 4–5 mm long and 3–4 mm in dia, with flat broad base, upright, with numerous florets (to 40 and more) 108. **A. bargusinensis** Spreng.
 + Capitula 3.0–3.5 mm long and 1.5–3.0 mm in dia, with broadly cuneate base, divergent or drooping; florets 23–30 105. **A. commutata** Bess.
- 37(35). Leaves sericeous 38.
 + Leaves glabrous or more weakly hairy 39.
38. Lower cauline leaves once or almost twice pinnately cut, lobes linear-lanceolate, 0.3–3.0 cm long; capitula on primary branches in short racemes or glomerules 107. **A. tomentella** Trautv.
 + Leaves pinnately cut, lobes narrowly linear, often 7–15 mm long; capitula in spikes on terminal branches 106. **A. campestris** L. var. **sericophylla** Rupr.
39. Lower cauline leaves twice, less often thrice pinnately incised, their lobes 3–10(20) mm long, linear; capitula ovoid, 1.5–3.0 mm in dia; outer involucre bracts glabrous or weakly hairy 106. **A. campestris** L.
 + Lower cauline leaves twice pinnately incised, their lobes narrowly linear, 7–15 mm long; capitula narrowly ovoid, up to 1.5 mm in dia; outer involucre bracts glandular or hairy 106. **A. campestris** L. var. **araratica** Novopokr.
- ++ Lower cauline leaves twice pinnately incised, their lobes to 10 mm long, linear; capitula ovoid or globose, 2–3 mm in dia; outer involucre bracts glandular or hairy 106. **A. campestris** L. var. **sosnovskyi** Novopokr.

Series 1. Dracunculi Poljak.—Perennials with simple or branched hairs or glabrous; leaves simple, linear or lanceolate-linear.

83. **A. dracunculus** L. Sp. pl. (1753) 849; Bess. in Bull. Soc. Nat. Mosc. VIII, 54; DC. Prodr. VI, 97; Ldb. Fl. Ross. II, 563; Turcz. Fl. baic.-dahur. II, 2, 49; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 524; Kryl. Fl. Alt. III, 633; Kom. Fl. Manchzh. III, 658; Fedtsch. Perech. Rast. Turk. IV, 190; Rydb. North Am. Fl. 34, part 3, 251; Pampan. in

530 Nuov. Giorn. Bot. Ital. n. s. XXXIV (1927) 653; Hegi, Ill. Fl. VI, 2, 635; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1035; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 350; Krascheninn. in Kryl. Fl. Zap. Sib., XI, 2768; Poljak. in Majeovski, Fl. 583.—*A. inodora* Willd. Enum. horti berol. II (1809) 864.—*A. redowskyi* Ldb. in Mém. Acad. Sc. Pétersb. V (1815) 574, non MB.—*A. desertorum* var. *macrocephala* Franch. Pl. Turk. (1883) 88, non Spr.—*Oligosporus condimentarius* Cass. in Dict. Sc. Nat. XXXVI (1826) 26.—Exs.: GRF Nos. 3178a, b, 3179.

Perennial. Rhizome woody, 0.5–1.5 cm thick, sparsely covered with rootlets and sometimes with well developed stolons; whole plant glabrous, smooth, green, less often hairy when young. Stems erect, solitary or few, 20–150 cm high, ribbed, usually branched, lower branches sterile. Leaves undivided, linear-lanceolate or almost linear, 1.5–8.0 cm long and 1–10(14) mm wide; lowermost cauline leaves sometimes with 3 lobes at apex. Capitula numerous, globose, drooping, (2)2.5–4.0 mm in dia, at apices of stem and branches in racemes, forming paniculate inflorescence. Involucral bracts smooth, outer bracts oblong or sublanceolate, inner bracts round-oval, with wide scarious margin. Peripheral florets pistillate, usually 7; their corollas tubular, expanded toward base; stigma lobes narrowly linear, subacute, exserted from corolla tube, divergent; disk florets staminate, 11–14, their corollas conical, with 5 teeth; anthers linear, apical appendages of anthers obtuse-angled, subacute, basal appendages shorter, subobtuse; stigma of abortive pistil not lobed, funnel-shaped at apex. Achenes small, 0.6 mm long, somewhat flat, ovoid, finely sulcate, brown. Flowering July to August.

Alkaline meadows, near birch groves, river terraces of meadows, steep valley slopes and old fallow lands, forest-steppe and steppe zones, as well as meadow slopes of low mountains and mountains.—*European part*: Baltic Region, Upper Dnieper, Upper-Volga, Volga-Kama, Middle Dnieper, Volga-Don, Trans-Volga, Black Sea Region, Crimea, Lower Don, Lower Volga; *Soviet Central Asia*: Aralo-Caspian Region (northern part), Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region; *Western Siberia*: Upper Tobol, Irtysh, Altai, Angara-Sayans, Dauria, Zeya-Bureya, Lena-Kolyma. *General distribution*: Central Europe, Balkans-Asia Minor, Mongolia, northern China, North America. Described from Siberia. Type in London.

Note. *A. dracunculus* L. varies within its range, which provides a basis to distinguish:

- 1) Var. *pratensis* Krasch. (*Spisok Rast. Gerb. Fl. SSSR*, X, No. 533 3179)—distinguished by a stem up to 2 m high, long and lax inflorescence, and leaves that are partly divided into 2 or 3 lobes; found in Kazakhstan steppes.



Plate XXV.

1—*Artemisia maximovicziana* Krasch. ex Poljak. habit; 2—*A. medioxima* Krasch. ex Poljak., habit.

2) Var. *turkestanica* Krasch.—distinguished by rather tall stems, large lanceolate leaves, and capitula up to 3–4 mm [wide]; distributed in Tien Shan, Pamiro-Alai.

3) Var. *pilosa* Krasch. (*Fl. Yugo-Vost. Evrop. Ch. SSSR*, VI. No. 1956)—distinguished by more or less densely hairy leaves and stems at the beginning of the vegetative growth; distributed in the Trans-Volga steppes.

4) Var. *humilis* Kryl. (*Fl. Alt.* III, p. 633)—distinguished by short plants (20–30 cm high) and a narrowly paniculate or almost racemose inflorescence; distributed in the West Siberian steppes.

5) Var. *redovskyi* Ldb.—distinguished by stramineous stems, globose, 2–3 mm wide, drooping capitula on long peduncles, forming a rather lax paniculate inflorescence; distributed in eastern Siberia and Far East.

Economic Importance. According to the data of M.I. Goryaev and R.N. Sazonov (1959), the recovery of essential oil is 0.5%. The oil contains aldehydes and a small quantity of ketones; bound alcohols—38.8%.

The above-ground parts of the plant contain the essential oil; the yield from plants collected near Saratov reaches 0.54% (of dry weight) and 0.17% (of fresh herb). According to the work of L. Kazakevich and O. Sobolevskaya (1928), the oil has the following constants: D_4^{20} —0.9408; $\alpha + 29.35^\circ$; n_D^{20} —1.4712; acid number 0.37; ester number 8.39; ester number after acetylation 29.96. It is insoluble in 70% alcohol, but dissolves in 80% alcohol in the ratio 1:0.76, and completely in 90% alcohol.

Tadzhik oil, according to the data of N.P. Kiryalov and D.P. Snegirev (1936), contains 84–85% d-sabinene, 7–8% resin, precipitating crystals at melting point of 48° , and 7% of a high melting part consisting of esters and, possibly, carbohydrates. According to the data of I.P. Tsukervanik and N. Mirkina (1935), the yield of oil was 0.06–0.3%; the oil contained up to 65% sabinene and 10% myrcene. According to foreign sources (cited in Goryaev, 1956), the oil contains up to 60–70% methylchavicol (estragol), 15–20% myrcene and ocimene, phellandrene, methoxycinnamic, anisic, and acetic aldehydes. The data of M.I. Goryaev, (cf. *Efirnye masla* [Essential Oils], *Fl. SSSR*, 1952, pp. 40, 41) erroneously attributed to this species, in fact, relate to *Artemisia schrenkiana* Ldb. Probably, the data of V.A. Vyshensky (1935) also relate to some other plant, as *A. dracunculus* does not grow in Turkmenia.

Traces of alkaloides have also been found in the leaves, stems and roots (Bankovsky, Zarubina, and Sergeeva, 1947).

The leaves and stems are used for pickling cucumbers and cabbage, and are used in folk medicine as an antiscorbutic and diuretic. Often it is a noxious weed. I.V. Larin (1956) suggests the following control measures: two mowings or pruning with a spade at a depth of 10 cm. The mowed plants can be used for making silage or, in extreme cases, as fuel. The fodder quality of the plant is not high.

84. **A. pamirica** Winkl. in Tr. Peterb. Bot. Sada, XI, 10 (1890) 329; O. Fedtsch. Fl. Pam. 114; Fedtsch. Perech. Rast. Turk. IV, 191; Pampan. in Nuov. Giron. Bot. Ital. n. s. XXXIV, 684.

Perennial. Plant more or less pubescent with forked hairs, later only in upper part or throughout glabrescent. Rhizome woody, branched, developing erect, sterile, leafy shoots; fertile shoots (20)35–45 cm high, straight or slightly bent, ascending at base, brownish or brownish-violet, branched (var. *aschurbajevii* Winkl.) or almost simple, leafy. All leaves simple, sessile, 1.5–3.0(4.0) cm long, lanceolate; lower leaves usually subobtuse, upper leaves acuminate. Capitula on short peduncles, divergent or drooping, globose, 2.0–3.5 mm in dia, crowded on branches or main stem, forming narrow, more or less long, racemose-paniculate inflorescence. Outer involucre bracts broadly lanceolate or oval, inner bracts larger, broadly oval, with wide scarious margin. Peripheral florets pistillate, 12–13, their corollas narrowly tubular; stigma lobes exerted from [corolla] tube, 2–3, linear, obtuse, divergent; disk florets 12–13, staminate, their corollas conical, with purple teeth; anthers linear; stigma of abortive pistil narrow funnel-shaped, not lobed. Flowering August.

Clayey and rubbly-clayey meadow-steppe slopes of mountains, in alpine zone and lower.—*Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region. *General distribution*: Dzhungaria-Kashgaria. Described from Lake Kara-Kul in Pamir. Type in Leningrad.

Note. The reported occurrence of *A. dracunculus* in western Tibet (Hook. *Fl. Brit.* 1882, 122), most probably relates to *A. pamirica* Winkl.

Economic Importance. According to the data of M.I. Goryaev, G.K. Kruglykina, and E.I. Satdarova (1959), the plant contains alkaloids. According to Goryaev and Sazonova, the yield of essential oil is 0.06–0.2%; the oil has an unpleasant smell and contains aldehydes and ketones. The distillate is very turbid.

85. **A. dracunculiformis** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk. SSSR, IX (1946) 172.

Perennial. Root woody, vertical. Stem herbaceous, 40–80 cm high, thick, erect, greenish-yellow, glabrous, sulcate-ribbed, almost woody at base, weakly leafy. Leaves yellowish-green or green, somewhat thick,

glabrous, 3–6 cm long and 4–6 cm wide, almost simple, more or less with 3 deep lobes at apex, lobes 1–2 cm long, lanceolate, subacute or subobtusely, contorted, or leaves simple, long-acuminate, gradually narrowed toward base, upper bracteal leaves simple, lanceolate, 5–10 mm long. Capitula on short peduncles, drooping, subglobose, 4–5 mm in dia, in long, narrow-pyramidal panicle. Involucral bracts glabrous, lustrous, white scarious on margin; outer involucral bracts narrowly lanceolate, inner bracts ovate, subobtusely. Peripheral florets pistillate, their corollas narrowly tubular, enlarged at base; stigma lobes narrowly linear, acute, exserted from corolla tube; disk florets staminate, their corollas reddish-violet in upper part, weakly hairy; anthers linear; stigma of abortive pistil narrow funnel-shaped, not lobed. Flowering July to August.

River valleys and slopes of terraces, along northern edge of forest-tundra and in southern part of arctic zone.—*Arctic*: Arctic Siberia (lower reaches of Lena, Olenek, Indigirka and Kolyma rivers). Endemic. Described from lower reaches of Lena River. Type in Leningrad.

86. **A. daghestanica** Krasch. and Por. in Izv. Bot. Sada Akad. Nauk SSSR, XXX (1932) 709–710; Grossh. Fl. Kavk. IV, 138.

Perennial. Plant 40–50 cm high, densely hairy with appressed hairs, later subglabrous; rhizome slender, ascending, developing sterile leafy shoots and fertile, erect, more slender, brown or violet-brown, straight or slightly flexuous branched stems. Cauline leaves simple, 1.0–3.5 cm long and 1–3 mm wide, narrowly linear, short-acuminate, strongly deflexed, somewhat stiff, uppermost small, narrowly paniculate [sic.; recte narrowly lanceolate], often 3–6 mm long. Capitula pedunculate, 1.5–4.0 mm long, drooping, remote, subglobose, 1–2 mm in dia, in depauperate pyramidal paniculate inflorescence. Involucral bracts glabrous, lustrous, with wide scarious border; outer involucral bracts ovate, inner bracts large, obovate. Peripheral florets 10, pistillate, their corollas filiform-tubular; stigma lobes linear-filiform, exserted from corolla tube, divergent; disk florets 5–6, staminate, their anthers linear (apical appendages of anthers obtuse), large, basal appendages smaller, subobtusely; stigma of abortive pistil almost funnel-shaped, densely [sic.; recte deeply] lobed. Achenes about 0.8 mm long, ovoid, somewhat flat, finely ribbed, brown. Flowering August.

Southern steppe slopes of mountains, in steppe zone, at 1,000–1,900 m.—*Caucasus*: Dagestan. Endemic. Described from Dagestan. Type in Leningrad.

87. **A. glauca** Pall. in Willd. Sp. pl. III (1800) 1831; Ldb. Fl. Alt. IV, 87; Bess. in Bull. Soc. Nat. Mosc. VIII, 57; DC. Prodr. VI, 97;

Ldb. Fl. Ross. II, 563; Turcz. Fl. baic.-dahur. II, 2, 50; Kryl. Fl. Alt. III, 633; Fedtsch. Perech. Rast. Turk. IV, 191; Rydb. North Am. Fl. 34, part 3, 251; Pampan. in Nuov. Giron. Bot. Ital. n. s. XXXIV, 657; Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 350; Kryl. Fl. Zap. Sib. XI, 2770; Poljak. in Majeovski, Fl. 4583.—Exs.: GRF Nos. 67, 3180a, 3181a, b, c, d.

536 Perennial. Rhizome horizontal or obliquely ascending, densely covered with rootlets, sometimes branched in upper part, sometimes nodulose, thickened at point of origin of stem; whole plant grayish-green or grayish (var. *incana* Bess.) from more or less dense tomentum of short, stellate hairs. Stems few (2–12) or single, erect, less often somewhat divergent, 15–20 cm (var. *humilis* Kryl.) or usually 25–70 cm high, green or reddish, often ribbed, branched, lower branches sterile. Leaves undivided, linear or linear-lanceolate, 1–7 cm long and 1–7 mm wide; less often some leaves, mainly on sterile shoots, twice or thrice divided. Capitula globose, 1.5–2.0 mm in dia, divergent or drooping, in dense, more or less broadly paniculate inflorescence or narrow (var. *humilis* Kryl.) paniculate inflorescence. Involucral bracts smooth, glabrous; outer involucral bracts lanceolate; inner round, with wide scarious border. Peripheral florets pistillate, 6–7, their corollas filiform-tubular, stigma lobes narrowly linear, acute, exserted from corolla tube; disk florets staminate, 6–7, their corollas narrowly conical, with 5 teeth, anthers linear, apical appendages of anthers acute, basal appendage not conspicuous, subacute, stigma of abortive pistil bilobed. Achenes small about 0.5 mm long, ovate, fusiform, brown. Flowering August. (Plate XXVIII, Fig. 3).

Alkaline meadows, near birch groves, steep riverbanks, old fallow lands, less often stony slopes, forest-steppe and steppe zones.—*European part*: Volga-Kama, Trans-Volga; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Angara-Sayans, Dauria. *General distribution*: Mongolia, North America. Described from Siberia. Type in Berlin?

Note. Hooker (*Fl. Br. Ind.*, 1882) reports this species for the western Himalayas, which is doubtful.

Series 2. *Simplicifoliae* Krasch.—Semishrubs, glabrous or weakly hairy (hairs simple); leaves simple, linear-lanceolate, partly with 2–5 lobes in upper part.

88. ***A. dimoana* M. Pop.** in Pochv. Eksp. v Bass. rr. Syr-Dari i Amu-Dari, II (1916) 75, 88.—**lc.**: Ibid., Plates 22a, 22b, 22c.

Perennial. Semishrub, 70–90 cm high. Root thick, woody, cordlike, with thick, woody, strongly reduced, branched stem covered with dull,

grayish-brown bark. Fertile stems (branches) erect, woody almost to apex, strongly branched, smooth, lustrous, stramineous. All leaves undivided, linear or linear-narrowly lanceolate, succulent, with short appressed hairs, short-acute; middle and partly upper cauline leaves 4–6 cm long, uppermost bracteal leaves linear, 3–5 mm long. Capitula sessile or on short peduncle, somewhat remote, divergent or drooping, ovoid, 3.5–4.0 mm long and 2 mm in dia, in lax racemes forming lax panicle or branches. Involucral bracts densely hairy; outer involucral
 537 bracts small, almost round, or oval strongly convex, brownish on outer side; inner bracts larger, oblong-ovate, scarious along margin. Peripheral florets pistillate, 3–4, their corollas small, tubular, narrowed in upper part; stigma lobes linear, divergent; disk florets staminate, 3–5, their corollas conical; anthers linear, apical appendages of anthers acute, basal appendages short, subobtusate; stigma of abortive pistil funnel-shaped at apex, not lobed. Achenes to 3 mm long, pyriform-ovoid, fusiform, ribbed. Flowering July to August.

Sands of desert zone.—*Soviet Central Asia*: Kara-Kum. Described from vicinity of Khiva. Type in Tashkent.

89. **A. kelleri** Krasch. in Otch. o Rab. Pochv.-Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2(1930) 274; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, X, 98.—**Exs.**: GRF No. 3188.

Semishrub, 60–80 cm high, densely hairy with appressed hairs, later glabrous; root woody, vertical, thick, developing short, rather thick, woody, perennial, prostrate or erect sterile shoots covered with gray, peeling bark. Stems rather numerous, strong, 3–4 mm thick, smooth, straw-yellow or brownish, woody in lower part, branched above. Leaves succulent, yellowish-green, 3–5(9) cm long and 1–3 mm wide, simple, narrowly linear or in upper part with 2–5 lobes, lobes linear, acute; upper cauline leaves and leaves on branches small. Capitula usually on long peduncle, ovoid, 3–4 mm long, drooping, in broad, lax, paniculate inflorescence. Involucre 3-rowed, glabrous; outer involucral bracts succulent, small, round, middle bracts ovate, inner ovate-oblong with wide scarious border. Peripheral florets pistillate, fertile, 5, their corollas, narrowly tubular, punctate-glandular; stigma lobes linear, short-acuminate, divergent; disk florets staminate, 9, their corollas narrowly conical, anthers on short filaments, linear, apical appendages of anthers subulate, basal appendages short, round; stigma of abortive pistil funnel-shaped, not lobed. Achenes to 1.8 mm long, oblong-ovoid, fusiform, finely ribbed, brown. Flowering August.

Sands of desert zone.—*Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region (Muyun-Kumy), Kara-Kum. Endemic. Described from Akhcha-Kuim in Turkmenia. Type in Leningrad.

Series 3. Psammophilae Poljak.—Semishrubs; lower cauline leaves long-petiolate, divided into 3–7 lobes or pinnately cut, lobes rather long.

90. **A. trautvatteriana** Bess. in Mém. Acad. Sc. Pétersb. IV (1845) 464.—*A. pauciflora* MB. Fl. taur.-cauc. II (1808) 290 p. p. exl. syn.—*A. pauciflora* MB. β . *cernua* Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 19.—**lc.**: Bess. op. cit. tab. V.

Perennial. Semishrub; root woody, branched in upper part, with short, woody, leafy sterile shoots. Stems 50–65 cm high, rather thick, strong, woody in lower part, covered with grayish-brown, peeling bark, brownish above, initially pubescent, later subglabrous, leafy, branched. Leaves densely hairy with appressed hairs, later subglabrous; lower cauline leaves and leaves of nonflowering shoots in fascicles, long-petiolate, 5–8 cm long, pinnatisect in 3–7 palmate lobes, lobes narrowly linear, subacute, (0.5)0.7–2.0(2.7) cm long; middle and upper leaves shorter, sessile, usually divided into 3–7 lobes; uppermost leaves short, simple, linear. Capitula ovate, 3 mm long and 1.5–1.8 mm in dia, sessile, densely spicate, crowded on branches, forming conical panicle. Outer involucre bracts succulent, broadly elliptical, short-acuminate, densely hairy, inner bracts larger, oval, keeled, glabrous or weakly hairy, with wide scarious margin. Peripheral florets pistillate, 5–7, their corollas in narrow in upper part, expanded below like bottle, stigma lobes linear, subobtus, divergent; disk florets staminate, 7–9, their corollas narrowly conical, anthers linear; stigma of abortive pistil funnel-shaped, short-ciliate. Flowering August.

Coastal sandy areas.—*European part*: Black Sea Region, Lower Volga. Endemic. Described from southern Ukraine (near Odessa and mouth of Dnieper River) and from vicinity of Astrakhan (var. β). Type in Kiev.

91. **A. salsoloides** Willd. Sp. pl. III (1800) 1832; Bess. in Bull. Soc. Nat. Mosc. VIII, 17; DC. Prodr. VI, 94; Bess. in Mém. Acad. Sc. Pétersb. IV, 455; Ldb. Fl. Ross. II, 560; Boiss. Fl. or. III, 362; Fedtsch. Perech. Rast. Turk. IV, 190; Grossh. Fl. Kavk. IV, 141; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 351; Kryl. Fl. Zap. Sib. XI, 2766; Poljak. in Majeviski, Fl. 585.—*A. tanaitica* Klok. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 362, 364.—**lc.**: Bess. op. cit. (1845) tab. II.—**Exs.**: GRF No. 3184a, b.

Perennial. Short semishrub, 20–30(45) cm high, with thick, woody root developing short, woody, strongly branched, perennial sterile shoots. Flowering stems numerous, erect, in lower part woody, brownish, glabrous or sometimes sparsely pubescent. Leaves glaucescent, glabrous

or sometimes covered with inconspicuous hairs; lower cauline leaves petiolate, 2.0–3.5 cm long, pinnately cut; middle cauline leaves palmately cut, upper simple, 1–2 cm long, linear, subacute. Inflorescence narrow, short, more or less dense raceme; capitula ovate, 2.5–3.0(3.5) mm long. Involucral bracts oval, glabrous, inner bracts wider, scarious
 539 along margin. Peripheral florets pistillate, usually 4–6, their corollas narrowly tubular; stigma lobes narrowly linear, exserted; disk florets staminate, 8–9, their corollas tubular-conical; anthers on short filaments, linear, apical appendages, of anthers narrowly angular, basal appendages short, subobtusate; stigma of abortive pistil funnel-shaped, with 2 short divergent lobes. Achenes to 1.2 mm long, ovate, somewhat flat, with slightly attenuate apex, dark brown. Flowering August.

Slopes of limestone outcrops, chalks, sometimes on outcrops of igneous rocks.—*European part*: Volga-Don, Trans-Volga, Volga-Kama, Black Sea Region, Lower Don, Lower Volga; *Caucasus*: Dagestan; *Western Siberia*: Upper Tobol (southwest). Endemic. Described from Western Siberia. Type in Berlin.

Note. Hooker's report (*Hook. Fl. Br. Ind.*, 1882, 321) about the occurrence of *A. salsoloides* Willd. in western Tibet is erroneous. According to the determination of I.M. Krascheninnikov, this plant belongs to *Artemisia welbyi* Hemsl. and Pears. The reported distribution of this species in the Altai is not supported by specimens.

92. **A. halodendron** Turcz. ex Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 17; DC. Prodr. VI, 94; Bess. in Mém. Acad. Sc. Pétersb. IV, 459; Ldb. Fl. Ross. II, 560; Turcz. Fl. baic.-dahur. II, 2, 48; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 527; Kom. Fl. Manchzh. III, 658.—**Ic.**: Bess. op. cit. (1845) tab. III.

Perennial. Semishrub to 50 cm high; root woody with thick, woody, perennial, sterile, leafy shoots. Stem ascending or erect, woody in lower part, brown, strongly branched with somewhat divergent branches. Leaves green, moderately hairy with long appressed hairs, later subglabrous; leaves of sterile shoots and lower cauline leaves petiolate, 3–5(6) cm long, usually once or almost twice pinnately incised into narrowly linear, often 1.0–1.5(2.0) cm long and 0.5–1.0 mm wide short-acuminate lobes; middle and upper leaves sessile, pinnate to palmately cut, at base with 3–5 narrow, incised auricles; uppermost bracteal leaves simple, linear, sometimes with 3–5 lobes. Capitula on short peduncles or sessile, ovoid, 4–5 mm long and 2.0–2.5 mm in dia, straight, in sparse racemes on weakly divergent branches, forming narrow panicle. Involucral bracts oval, glabrous, smooth, with wide scarious border, peripheral florets 5, pistillate, fertile, their corollas narrowly tubular, slightly enlarged at base; stigma lobes linear, obtuse, divergent; disk

florets staminate, 10–11, their corollas narrowly conical; anthers linear, apical appendages of anthers acute, basal appendages smaller, obtuse, roundish; stigma of abortive pistil funnel-shaped, not lobed. Achenes 1.5 mm long, ovate, with somewhat attenuate apex, finely ribbed, dark brown. Flowering August. (Plate XXVIII, Fig. 1).

Saline lands, saline sands, sometimes on slopes of [mud] volcanic
540 cones.—*Eastern Siberia*: Dauria. *General distribution*: Mongolia, northern China (west). Described from saline lands of Dauria and Mongolia. Type in Leningrad.

93. **A. quinqueloba** Trautv. in Bull. Soc. Nat. Mosc. XXXIX, I (1866) 348; Fedtsch. Perech. Rast. Turk. IV, 190.

Perennial. Semishrub, (40)50–75(85) cm high; root vertical, woody, thick, thickened above, with strongly reduced, branched, woody trunk covered with brownish-gray fibrously cracking bark. Stems rather numerous, straight or slightly flexuous, more slender, virgate, branched, stramineous, usually densely hairy or partly glabrous (particularly in fall). Leaves more or less hairy on both sides with dense appressed hairs; lower leaves long-petiolate, usually 3–4(5) cm long, pinnatisect into 7 linear, 5–10(15) cm long and 1 mm wide, subacute lobes; middle and upper leaves with 3–5 incised, sessile, lobes at base with palmately cut or ternate auricles; uppermost leaves bracteal, simple, linear. Capitula pedunculate, drooping, broadly ovate or subglobose, to 2.5 mm in dia and 3 mm long, remote on divergent branches in lax, spreading, racemose-paniculate inflorescence. Involucral bracts hairy, with short appressed hairs; outer involucral bracts oblong-ovate, inner bracts wider, oval, with scarious border. Peripheral florets pistillate, 3–5, their corollas narrowly tubular, punctate-glandular, stigma lobes linear, acute, divergent; disk florets staminate, 5–9, their corollas narrowly conical, with straight, hairy teeth, anthers linear; stigma of abortive pistil funnel-shaped, not lobed. Flowering August.

Sands of desert zone.—*Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region. Endemic. Described from sands along Sarysu River. Type in Leningrad.

Note. It is distinguished from *A. arenaria* DC. by less divided leaves, broadly ovoid or subglobose capitula, a scarcely hairy involucre, and squarrose, stiff hairy corolla teeth of the disk florets.

94. **A. arenaria** DC. Prodr. VI (1837) 94; Bess. in Mém. Acad. Sc. Pétersb. IV, 474; Ldb. Fl. ross. II, 2, 561; Boiss. Fl. or. III, 362; Fedtsch. Perech. Rast. Turk. IV, 190; Grossh. Fl. Kavk. IV, 141; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, IV, 352; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2767; Poljak. in Majevski, Fl. 585.—A.

- pauciflora* MB. Fl. taur.-cauc. II (1808) 290 p. p.; Bess. in Bull. Soc. Nat. Mosc. VIII, 18.—*A. sabulosa* Willd. in herb. and *A. fruticosa* Willd. ex adnot. Stev.—*A. inodora steveniana* Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 44.—*A. inodora* Ldb. Fl. Ross. II (1844–1846) 566, pro parte (non Web.).—*A. tschernieviana* Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 31; DC. Prodr. VI, 95; Bess. in Mém. Acad. Sc. Pétersb. IV, 480; Ldb. Fl. Ross. II, 562; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, XI, 47.—**541** *Ic.*: Bess. in Mém. Acad. Sc. Pétersb. IV, tab. XII.—*Exs.*: GRF Nos. 3187, 3288a, b, sub. nom. *A. tschernieviana* Bess.

Perennial. Semishrub (35)50–75(100) cm high; root thick, woody, with woody, perennial, strongly reduced, branched trunk covered with brownish-gray cracking fibrous bark. Flowering stems rather numerous, straight or weakly flexuous, curved, more slender, virgate, straw-yellow, more or less hairy, later glabrous or subglabrous, branched above, branches more or less divergent. Leaves hairy, later glabrous; lower cauline leaves withering early petiolate, 2–5(6) cm long, twice pinnately incised, terminal lobe often 5–15 mm long, narrowly linear, short-acuminate; middle cauline leaves usually sessile, simple pinnate or with 3–5 lobes; uppermost leaves bracteal, simple, narrowly linear or sometimes with 2 lateral lobes at base. Capitula on short peduncle, ovate or broadly ovoid, 2.5–3.0–4.0 mm long and 1.6–2.5(3.0) mm in dia, in lax or rather dense racemes on branches, forming spreading paniculate inflorescence. Involucral bracts elliptical, with scarious border; outer involucral bracts herbaceous, inner bracts membranous, smooth. Peripheral florets pistillate, fertile, 3–5, their corollas obconical, enlarged at base; stigma lobes narrowly linear, divergent; disk florets staminate, 6–9, their corollas narrowly conical; anthers linear, apical appendages of anthers linear, acute, basal appendages shorter, subacute; stigma of abortive pistil with 2 short lobes. Achenes 1 mm long, oblong-ovate, somewhat flat, finely ribbed, blackish-brown. Flowering August.

Sands in steppe zone, sometimes near pine forests, along seacoasts.—*European part*: Volga-Don (southern part), Black Sea Region, Bessarabia, Lower Don, Lower Volga; *Caucasus*: Eastern Transcaucasia, Dagestan; *Soviet Central Asia*: Aralo-Caspian Region, Kara-Kum, Kzyl-Kum, Lake Balkhash Region. *General distribution*: Balkans-Asia Minor. Described from area between Odessa and mouth of Dniester River. Type in Geneva.

Note. Var. *tschernieviana* (Bess.) Grossh. (*Fl. Kavk* IV, 141), distributed in the western Caspian Region, is distinguished by long branchlets and remote capitula. However, separation of this variety as an independent species, as proposed by Besser, is not adequately justified.

Economic Importance. From a half-dried plant doubtfully belonging to *A. arenaria* DC., V.I. Isaev (1932) obtained by distillation 0.9–1.1% of light yellow, highly odorous essential oil with the following constants: D^{15}_D —0.869; α_D —0.06°; n_D —1.4820; acid number—0.3; ester number—33; ester number after acetylation—27.8. The presence in the oil of 2% phenols and 2% ketones was established. A plant collected 6 km from Irgiz, according to N.I. Bakanina (Goryaev, 1952), yielded 0.14% essential oil from absolute dry matter. The oil is yellow in color with a pleasant smell, and a pleasant but slightly pungent taste. Constants of the oil are: D^{20}_D —0.8692; n_D^{20} —1.4183; acid number—2.05; ester number—28.4; saponification number—30.45. Its reaction to aldehydes was positive.

It is a good stabilizer of shifting sands and ought to be widely used for such purposes. The data on its fodder qualities are inadequate, and it is necessary to conduct additional studies for a definitive evaluation of the nutritive value of this psammophilous wormwood for pasturing animals (I.V. Larin, 1956).

95. *A. albicerata* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 173.—Exs.: GRF No. 3289.

Perennial. Semishrub, (35)45–65(70) cm high, densely appressed hairy, later glabrous; root vertical, woody, with short, perennial, woody, sterile shoots covered with gray peeling bark. Fertile shoots straight, smooth, lustrous, whitish-waxy in lower part, brownish-yellow above, with divergent branches. Leaves somewhat thick, green; lower and middle cauline leaves 5–8 cm long, mostly pinnately cut or ternate, with fewer lobes, lobes narrowly linear, semicylindrical, 3–4 cm long and 1 mm wide, with stiff somewhat obtuse apices; upper leaves simple, undivided or sometimes some with 5–7 lobes, almost pinnately cut, lobes strongly elongated, flat; uppermost bracteal leaves small. Capitula numerous, ovoid, 2.5–3.0, mm long and 2 mm in dia, on short peduncle, drooping, in broad, pyramidal-paniculate inflorescence. Involucre glabrous; outer involucral bracts small, almost round, fleshy, gibbous on outer side; inner bracts oval, convex, with white scarious border. Peripheral florets pistillate, few (3–4), their corollas narrowly tubular; stigma lobes linear, obtuse, straight; disk florets staminate (7–9), their corollas tubular-conical, anthers on short filaments, lanceolate-linear, apical appendage of anthers acute, basal appendage shorter, acute, stigma of abortive pistil with 2 short lobes. Achenes up to 1 mm long, ovoid, flat, finely ribbed, dark brown. Flowering August.

Sands of desert zone.—*Soviet Central Asia*: Lake Balkhash Region. Endemic. Described from Ili River valley. Type in Leningrad.

Note. This species is very close to *A. arenaria* DC., but differs from it by usually less divided leaves and rather long, narrowly linear leaf lobes. In my opinion, these characters are not adequate to treat it as a species.

96. *A. saposhnikovii* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 412.

543 Perennial. Whole plant glabrous, 25–35 cm high; root vertical, rather thick, woody. Stems several or numerous, straight, slender, pale straw-yellow, woody in lower part, sometimes red, simple or almost simple. Lower cauline, leaves petiolate, 2.0–2.5 cm long, pinnatisect or more or less twice pinnately incised, lobes fewer, linear, 3–7 mm long, subacute; middle and partly upper cauline leaves sessile (usually with linear auricles at base), with 5 lobes; uppermost leaves bracteal, simple, linear. Capitula on short peduncles, approximate, divergent or drooping, broadly ovoid, 3–4 mm long and 2.0–2.5 mm in dia, at stem apices in simple raceme, below on short, weakly divergent branches in narrow racemose-paniculate inflorescence. Involucral bracts glabrous, with wide scarious border; outer involucral bracts oval, small, inner bracts considerably larger, oblong or elliptical, acute. Peripheral florets pistillate, 4, their corollas tubular, enlarged at base; stigma lobes 2–3, linear, obtuse, divergent; disk florets staminate, 8; anthers linear; stigma of abortive pistil with 2 short, straight lobes. Achenes to 1.5 mm long, ovate, terete, finely ribbed, brown. Flowering August. (Plate XXX, Fig. 3).

Stony mountain slopes, in valleys on gravel beds.—*Soviet Central Asia*: Tien Shan. Described from Inylchek River valley. Endemic. Type in Leningrad.

97. *A. songarica* Schrenk, Enum. pl. nov. I (1841) 49; Ldb. Fl. Ross. II, 561; Boiss. Fl. or. III, 362; Krasn. in Spisok Rast. Sbor. in V. Tyan-Shan. 67; Fedtsch. Perech. Rast. Turk. IV, 190; Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXIV, 03.

Perennial. Semishrub, 30–40 cm high, weakly hairy when young, later glabrous; root woody, vertical, usually with numerous, strongly reduced, woody, perennial, ascending shoots covered with light yellowish-gray, peeling bark. Fertile shoots numerous, virgate, somewhat flexuous, smooth, stramineous brownish, strongly branched, with almost horizontally divergent branches. Lower and middle cauline leaves pinnately cut, with 5–7 oblong, simple lobes or palmately cut: lobes linear, 4–12 mm long, short-acuminate; upper bracteal leaves small, sessile, narrowly linear. Capitula ovate-globose or subglobose, sessile or on short peduncle, 1.5–2.0 mm in dia, remote, divergent, in lax,

spreading panicle. Involucral bracts roundish-ovate, with wide scarious border. Peripheral florets pistillate, 2–4, their corollas narrowly tubular; stigma lobes linear, straight; disk florets staminate, 6–8, their corollas conical, pinkish; anthers linear; stigma of rudimentary pistil funnel-shaped. Achenes 1.5 mm long, ovate, indistinctly finely ribbed, brown. Flowering July.

Hummocky sands and sandstone outcrops, in desert zone.—*Soviet Central Asia*: Lake Balkhash Region (basin of Ili River). *General distribution*: Dzhungaria-Kashgaria. Described from Dzhungaria. Type in Leningrad.

544 *Series 4. Palmatisectae* Poljak.—Leaves grayish from thin, silky, appressed hairs; lower cauline leaves round or oval, palmately cut into 4–7 lobes.

98. **A. lipskyi** Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 411.

Perennial. Root thick, woody, with strongly reduced, erect, woody, peripheral shoots covered with light brown, peeling bark. Fertile shoots few, 35–40 cm high, arcuate or almost straight, weakly flexuous, brownish, almost round, finely tomentose, weakly leafy, branched. Leaves whitish-lanate from thin, silky, appressed hairs on both sides, lower cauline leaves long-petiolate, 3–5 cm long, petioles strongly thickened at base, amplexicaul, lamina round or broadly oval, palmately parted into 4–7 lobes, lobes with (2)3–5 secondary lobes, such lobes lanceolate-linear, short-acuminate, 3–7 mm long; middle leaves short-petiolate or sessile; bracteal leaves mostly simple, linear. Capitula ovoid, to 2 mm wide, on short peduncles or subsessile, crowded on branches in narrowly paniculate inflorescence. Involucral bracts whitish-lanate, with scarious margin; outer bracts oval, inner bracts somewhat larger, oblong-ovate. Receptacle convex, hemispherical, glabrous. Peripheral florets pistillate, 6, their corollas narrowly tubular, enlarged at base; stigma lobes linear, acute, straight, divergent; disk florets staminate, 12, their corollas narrowly conical, anthers linear, apical appendages of anthers acute, basal appendages short, obtuse; stigma of abortive pistil funnel-shaped. Flowering August.

Sandy places in mountain river valleys.—*Soviet Central Asia*: Pamiro-Alai Region (Karategin). Described from Surkhob. Type in Leningrad.

Note. Close to *A. kuschakeviczi* Winkl. but is distinguished by greater height, narrow capitula, and a hairy punctate-glandular corolla.

99. **A. kuschakeviczi** Winkl. in Tr. Peterb. Bot. Sada, XI (1890) 330; O. Fedtsch. Fl. Pam. 116; Fedtsch. Perech. Rast. Turk. IV, 190.

Perennial. Whole plant whitish-silky from fine appressed hairs; root thick, woody, vertical, with underground, short, woody, perennial shoots with above-ground parts having densely leafy apices forming thickset tussocks. Stems rather numerous, 5–12(15) cm high, erect or ascending, weakly leafy, simple or with short branches, covered with remnants of leaf petioles at base. Lower cauline leaves and leaves of sterile shoots petiolate, 1–3 cm long, petioles thickened at base, lamina round, divided into 5–7 palmate lobes, with 3–5, less often 2 secondary lobes, less often simple, such lobes lanceolate-linear, acute, 2–5 mm
545 long; upper cauline leaves sessile, divided into 3–5 lobes; uppermost leaves bracteal, simple, linear. Capitula ovoid, 25 mm in dia, on short peduncles, upper capitula crowded; lower capitula remote, in simple racemose, less often racemose-paniculate inflorescence. Involucral bracts oval, with scarious border, outer involucral bracts convex, densely hairy, inner subglabrous. Receptacle convex, conical, glabrous. Peripheral florets pistillate, fertile, 5–6, their corollas narrowly tubular, somewhat enlarged at base; stigma lobes linear, acute; disk florets staminate, 9, their corollas tubular-conical, glabrous; anthers linear, apical appendages acute, basal appendages short, obtuse; stigma of abortive pistil funnel-shaped. Achenes to 2 mm long, narrowly linear, with 4-angled, blackish-brown. Flowering August.

Rubbly-gravelly deposits along mountain streams, near lakes in high altitude-desert zone, at 3,500–4,000 m.—*Soviet Central Asia*: Pamiro-Alai Region. Endemic. Described from Chonsu River and Lake Karakul in Pamir. Type in Leningrad.

Note. It is quite likely that this species is found in the high-altitude areas of western China and the Himalayas bordering eastern Pamir.

Series 5. Japonicae Krasch. ex Poljak.—Leaves of sterile shoots and lower cauline leaves divided, with acute teeth, middle cauline leaves pinnatifid.

100. **A. japonica** Thunb. Fl. Japon. (1784) 308; Willd. Sp. pl. III, 1847; Bess. in Bull. Soc. Nat. Mosc. VIII, 50; Kom. Fl. Manchzh. III, 654, excl. synonym.—*A. japonica* Thunb. *α. japonica* Maxim. in Bull. Acad. Sc. Pétersb. VIII (1872) 526, excl. synonym.; Nakai, Fl. Korean. 33; Pampan. in Nuov. Giron. Bot. Ital. n.s. XXXV, 660, includ. var. *japonica* Maxim. and f. *typica* Nakai; Sugaw. Ill. Fl. Saghal. IV, 1807.—**lc.**: Sugaw. *ibid.* tab. 828.

Perennial. Plant glabrous, 65–90 cm high; root thick with long (sometimes almost as long as stem). Sterile shoots and densely leafy

and solitary or few, erect, glabrous, branched stems. Leaves of sterile shoots and lower cauline leaves 5–8 cm long, almost round-cuneate or oblong-cuneate, incised-acute-toothed, entire below, at base with 1–2 pairs of narrow, linear, acute lobes; middle cauline leaves somewhat shorter, narrowly cuneate, incised-acute-toothed or almost pinnately divided; upper leaves smaller, simple, lanceolate or lanceolate-linear, entire or with few, acute, linear-lanceolate teeth; upper-most leaves bracteal, very small, usually not exerted from inflorescence, simple, narrowly lanceolate. Capitula numerous, pedunculate, broadly ovoid, to 2 mm long, more or less approximate on branches, forming broad panicle inflorescence. Involucral bracts oval, smooth, with more or less wide scarious margin; outer bracts smaller than inner. Peripheral florets pistillate, 7, their corollas obconical, strongly expanded at base; stigma lobes exerted from corolla tube, narrowly linear, subacute, recurved; disk florets staminate, 7, their corollas conical, glabrous, anthers linear, apical appendages acute, basal appendages shorter, subobtusate, stigma of abortive pistil funnel-shaped, not lobed. Achenes 1 mm long, fusiform, ovoid, finely sulcate, dark-brown. Flowering August.

Riverbanks and gravelly deposits, dry meadows, slopes of mountain ridges, among scrub thickets or forests.—*Far East*: Ussuri. *General distribution*: Northeastern China, Japan. Described from the vicinity of Nagasaki. Type in Uppsala.

101. *A. littoricola* Kitam. in Acta Phyt. et Geobot. V (1936) 94.—*A. desertorum* Takeda in Bot. Mag. Tokyo, XXIV (1911) 21 non Sprengel; Nakai in Bot. Mag. Tokyo, XXVI, 99.—*A. japonica* var. *macrocephala* f. *sachalinensis* Pamp. in Nuov. Giron. Bot. Ital. n.s. XXXIV (1927) 668.—*A. japonica* var. *rotundifolia* f. *vestita* Pamp. *ibid.* p. 669, pro parte.

Perennial. Rhizome creeping, woody, developing long, sterile, leafy shoots. Stems erect or weakly divergent, 30–100 cm high, grayish-lanate, later glabrous, branched, branches arcuate or straight, divergent. Leaves of sterile shoots oblong-cuneate, including petiole, 5–10 cm long, palmately or pinnately divided or pinnately lobed, lobes attenuate, pinnate, secondary lobes obtuse, somewhat succulent, on both sides grayish-woolly; lower cauline leaves withering early; middle cauline leaves oblong-cuneate or elliptical, with auricles, pinnately divided, palmate or ternate, lobes remote, long, linear-lanceolate, with distinct venation beneath, grayish-tomentose, later subglabrous; upper cauline leaves simple, linear-lanceolate, obtuse. Capitula numerous, crowded, pedunculate, subglobose, to 2.5–3.0 mm long and up to 2 mm in dia, on branches, with dense drooping racemes forming long pyramidal



panicle. Involucral bracts rectangular, oval, with scarious border, outer bracts small, on spine gibbose; inner involucral bracts larger, obtuse. Peripheral florets 7–8, pistillate, their corollas tubular, enlarged; stigma lobes exserted from corolla tube, linear, obtuse, divergent; disk florets
 549 6, pistillate, their corollas narrowly campanulate, apical appendages of anthers acute, basal appendages smaller, subobtuse; anthers linear; stigma of abortive pistil funnel-shaped, undivided. Achenes 1 mm long, oblong-ovoid, somewhat flat, smooth, brown. Flowering August to September.

Seacoasts.—*Far East*: Sakhalin (and Kuril Islands). *General distribution*: Japan. Described from Hokkaido Island. Type in Tokyo.

102. **A. desertorum** Spreng. Syst. veg. III (1826) 490; Bess. in Bull. Soc. Nat. Mosc. VIII, 64; Turcz. Fl. baic.-dahur. II, 2, 51; Maxim. Pr. Fl. Maur. 157; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, XI, 3284.—*A. desertorum* var. *sprengeliana* Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 65; DC. Prodr. VI, 98; Ldb. Fl. Ross. II, 564; Pampan. in Nuov. Giron. Bot. Ital. n. s. XXXIV, 650; Ling Jong in Contrib. Inst. bot. Acad. Peiping. II, No. 10 (1934) 512.—*A. japonica* Thunb. var. *desertorum* Maxim. in Bull. Acad. Sc. Pétersb. VIII (1872) 527.—*A. japonica* Thunb. β . *manchurica* Kom. Fl. Manchzh. III (1907) 654; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1035.—*Ic.*: Kom. and Alis. op. cit. Plate 306.—*Exs.*: GRF No. 3284.

Perennial. Plant glabrous, with short woody rhizome thickened in upper part. Stems solitary, less often few, (50)65–90 cm high, straight, smooth, light brown, sometimes reddish-violet, leafy, branched above; sterile shoots short, leafy. Leaves strongly variable in size and degree of cutting; lower leaves long-petiolate, most often 4–10 mm long, pinnatifid, with broadly linear or linear-lanceolate lobes often, in turn, divided into 3 sharp teeth or oblong-obcuneate, strongly narrowed toward base, more or less incised-toothed with acute teeth in upper part; middle cauline and upper leaves smaller, short-petiolate or sessile, at base with auricles divided into 3–5 linear lobes, lamina often divided into 3–5(7) lobes, less often pinnate, lobes linear, short-acuminate, undivided, sometimes with short, subacute teeth; uppermost bracteal leaves simple, small, linear. Capitula numerous, on short peduncles, divergent or drooping, broadly ovoid, 2.0–2.5 mm long, in dense racemes, clustered in narrow compact panicle. Involucral bracts glabrous, with wide scarious border; outer bracts oval; inner bracts slightly larger. Peripheral florets pistillate, their corollas narrowly tubular; stigma lobes exserted from corolla tube, linear, subobtuse, divergent; disk florets fewer, staminate, their corollas narrowly conical, anthers linear, stigma of abortive pistil with 2 short divergent lobes. Achenes 0.5 mm long, ovate, convex, finely ribbed, black. Flowering August. (Plate XXX, Fig. 4).

River valleys in dry meadows, mountain slopes, in scrub thickets or in deciduous forests.—*Eastern Siberia*: Dauria; *Far East*: Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Northeastern China. Described from Siberia. Type in Berlin.

Note. Erroneously cited for Soviet Central Asia and western Tibet.

103. *A. macilenta* (Maxim.) Krasch. in Mat. po Ist. Fl. i Rast. SSSR, II (1946) 156.—*A. campestris* var. *macilenta* Maxim. in Prim. Fl. Amur. (1859) 158.—*A. capillaris* var. *simplex* Maxim. in Bull. Acad. Sc. Pétersb. VIII (1872) 524.—*A. commutata* Bess. var. *helmiana* Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 69.—*A. desertorum* Spr. var. *macilenta* Pampan. in Nuov. Giron. Bot. Ital. n. s. XXXIV (1927) 651.—**Exs.**: GRF No. 3183.

Perennial. Plant green, with occasional, very fine, appressed hairs. Rhizome woody, short, nodulose above, developing long, sterile, leafy shoots; stems straight, slender, glabrous, light brownish, sometimes violet-brown in lower part, 40–70 cm high, almost simple, with short branches above. Leaves glabrous; leaves of sterile shoots (clustered at their apices) and lower cauline leaves 4–5 cm long including petiole, twice pinnately incised, lobes narrowly linear, 7–12(15) mm long, 0.3–0.6(1.0) mm wide, scarcely acuminate; middle and upper cauline leaves sessile or subsessile, palmately cut; uppermost bracteal leaves small, simple, filiform-linear. Capitula numerous, approximate, pedunculate, divergent or drooping, subglobose or broadly ovate, 2.0–2.5 mm long and 1.0–1.5 mm in dia, in lax racemes on short branches usually appressed to stem and forming narrow, dense panicle. Involucral bracts glabrous, with wide scarious border; outer bracts oval; inner bracts larger, broadly lanceolate, subacute. Peripheral florets pistillate, their corollas small, obconical, at base strongly enlarged; stigma lobes filiform-linear, straight; disk florets staminate, their corollas conical; anthers on short filaments, linear, apical appendages of anthers acute, basal appendages short, subobtusate; stigma of abortive pistil with 2 short, linear straight lobes. Achenes about 0.7 mm long, ovate, finely ribbed, brown. Flowering August.

River valleys in sandy places, among scrubs, on slopes of [mud]volcanic cones in forest zone.—*Far East*: Zeya-Bureya, Uda River Area, Ussuri. *General distribution*: Northern China. Described from Bureya Mountain. Type in Leningrad.

104. *A. capillaris* Thunb. Fl. Japon. (1784) 309; Willd. Sp. pl. III, 1818; Spreng. Syst. veg. III, 487; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 524; Kom. Fl. Manchzh. III, 653 p. p.—*A. capillaris* var. *sachalinensis* Pamp. in Nuov. Giron. Bot. Ital. n. s. XXXIV (1927)

646; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1035; Ling Jong in Contr. Inst. bot. Acad. Peiping. II, No. 10, 509 p. p.—*A. sachalinensis* Tiles. ex Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 48; DC. Prodr. VI, 96; Ldb. Fl. Ross. II, 562.—*A. scoparia* Maxim. op. cit. 523; Nakai, Fl. Korean. (1911) 32.

551 Annual. Root vertical, slender. Stem solitary, slender, straight, 30–50 cm high, brown or reddish-brown. Leaves of sterile shoots and basal leaves sericeous pubescent, 2–4 cm long, simple pinnate or almost twice pinnately incised, lobes 8–12 mm long and 0.5–1.0 mm wide, simple, linear or narrowly lanceolate-linear, flat, short-acuminate, or with occasional more or less long teeth; cauline leaves glabrous, short-petiolate and sessile, once or twice pinnately incised, lobes long, narrowly filiform, obtuse; uppermost bracteal leaves small, simple, filiform. Capitula numerous, approximate, drooping, pedunculate, broadly ovoid, 1.3–2.0 mm long and 1.0–1.5 mm in dia, on branches, in secund, dense, drooping racemes forming more or less lax panicle. Involucral bracts glabrous, smooth, with wide scarious border; outer bracts oval, acute; inner bracts larger, elliptical. Peripheral florets pistillate, 3–5, their corollas narrowly tubular, with 2 teeth; stigma lobes narrowly linear, straight; disk florets staminate, 5–7, their corollas narrowly conical; anthers on short filaments, linear, apical appendages of anthers acute, basal appendages short, round, stigma of abortive pistil with 2 erect lobes. Achenes 0.7 mm long, ovoid, somewhat flat, with attenuate apex, dark brown, finely ribbed. Flowering August. (Plate XXX, Fig. 2).

Riverbanks and marine coastal areas in forest zone.—*Far East*: Uda River Area, Ussuri, Sakhalin. *General distribution*: Japan, northern China. Described from Pescadores Islands. Type in Uppsala.

Series 6. Commutatae Poljak.—Perennials; leaves divided into lanceolate-linear, narrowly linear, or linear-filiform lobes; inflorescence paniculate.

105. *A. commutata* Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 70; DC. Prodr. VI, 98; Ldb. Fl. Ross. II, 567 p. p.; Turcz. Fl. baic.-dahur. II, 2, 51; Kryl. Fl. Alt. III, 635 p. p.; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 352; Kryl. Fl. Zap. Sib. XI, 2774.—*A. commutata* var. *helmiana* Bess. op. cit. 695; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1036.—*A. commutata* var. *gebleriana* Bess. op. cit. 70; DC. Prodr. VI, 98; Ldb. Fl. Ross. II, 567; Kryl. Fl. Alt. III, 635.—*A. campestris* Maxim. Pr. Fl. Amur. (1859) 158.—*A. desertorum* var. *sprengeliana* Bess. f. *helmiana* (Bess.) Pamp. and f. *gebleriana* (Bess.) Pamp. in Nuov. Giron. Bot. Ital. n. s. XXXIV (1927) 650.

—*A. pubescens* Ldb. in Mém. Acad. Sc. Pétersb. V (1812) 568; Bess. op. cit. 67; Ldb. op. cit. 565.—*A. dolosa* Krasch. in Sistemat. Zam. Gerb. Tomsk. Univ. 1, 2 (1949); Kryl. Fl. Zap. Sib. XI, 2775.—*A. borealis* var. *mertensii* Bess. and *A. borealis* var. *ammaniana* Bess. in herb. quoad pl. altaic.—*A. monostachya* Bge. nom. in herb.—*Oligosporus affinis* Less. in Linnaea, IX (1835) 191.—Exs.: GRF Nos. 3182, 3285 (pro var. *gebleriana*), 3183, 3286 (pro var. *helmiana*), 4048 (pro var. *pubescens*).—Ic.: Fl. Yugo-Vost. Evrop. Ch. SSSR, Fig. 684.

Perennial. Tap root, woody, to 1.5 cm thick. Stems few or solitary, 35–60(70) cm high, herbaceous, erect, slender, reddish-brownish, glabrous or hairy, leafy. Leaves glabrous or hairy beneath when young; leaves of sterile shoots, basal and lower cauline leaves long-petiolate, often 4–8(12) cm long and 1.5–2.0 cm wide, twice pinnately incised, with linear or linear-lanceolate, acute, 1–3 cm long and 0.5–1.5(2.0) mm wide secondary lobes; middle cauline leaves simple pinnate, sessile; upper bracteal leaves simple, narrowly linear. Capitula on short or elongated peduncles, oblong or broadly ovoid, 3.0–3.5 mm long and (1.5)2.0–3.0 mm in dia, divergent or drooping, on branches in lax racemes (forming a narrow panicle) or sometimes in more or less broadly paniculate inflorescence. Involucral bracts glabrous, outer involucral bracts broadly oval, subacute, inner bracts elliptical, with wide scarious margin. Receptacle convex, glabrous. Peripheral florets pistillate, fertile, 10–15, their corollas narrowly tubular, to 15 mm long, with 2 teeth; stigma lobes filiform-linear, exserted from tube, divergent; disk florets 13–15, staminate, their corollas tubular-conical, glabrous; anthers on short filaments, linear, apical appendages of anthers subulate, basal appendages short, subobtusate; stigma of abortive pistil with 2 short, narrowly linear, divergent lobes. Achenes 1 mm long, oblong-ovoid, indistinctly finely ribbed, blackish-brown, with flat round edge. Flowering August. (Plate XXVIII, Fig. 4).

Alkaline steppe meadows, clayey herb-steppe slopes, low mountains and [mud]volcanic cones, sometimes in open birch groves and pine forests, in forest-steppe zone and in adjoining regions of forest and steppe zones.—*European part*: Volga-Kama; *Western Siberia*: Upper Tobol, Irtysh, Altai, Ob River Area; *Eastern Siberia*: Angara-Sayans, Yenisei, Dauria, Lena-Kolyma; *Far East*: Zeya-Bureya. *General distribution*: Mongolia. Described from southern Urals? Type in Kiev.

Note. The following varieties can be distinguished:

1. Var. *helmiana* Bess.—Stem solitary, slender, 1–2 mm thick; panicle narrow, with small, drooping, globose, capitula 1.5–2.0 mm in dia.

2. Var. *gebleriana* Bess.—Stems thicker, 2–4 mm thick; plant glabrous or weakly pubescent, with large (2.5–4.0 mm long) ovate, upright capitula.

3. Var. *dolosa* (Krasch.) Poljak.—Similar to var. *helmiana* Bess., with capitula up to 3 mm wide, in narrow, racemose-paniculate inflorescence, with stems 8–30 cm high, distributed in southeastern Altai.

4. Var. *pubescens* (Ldb.) Poljak.—With rather densely hairy leaves and capitula to 2 mm in dia; eastern Siberia.

- 553 106. **A. campestris** L. Sp. pl. (1753) 846 and (1763) 1185; Willd. Sp. pl. III, 1827; Bess. in Bull. Soc. Nat. Mosc. VIII, 40; Ldb. Fl. Ross. II, 565; Boiss. Fl. or. III, 363; Kryl. Fl. Alt. III, 634 p. p.; Fedtsch. Perech. Rast. Turk. IV, 191 p. p.; Rydb. North Am. Fl. 34, 254; Hegi, Ill. Fl. IV, 2, 666 p. p.; Grossh. Fl. Kavk. IV, 142; Vilda växter i Nord. ut Lagerberg, IV, 1641; Poljak. in Majevski, Fl. 585.—*A. campestris* var. *bottnica* Hartm. Handbook Scand. Fl. XI (1897) 6.—*A. commutata* var. *bottnica* Krasch. in Mat. po Istor. Fl. i Rast. SSSR, II (1946) 152.—*A. borealis* ssp. *bottnica* (Lundstr.) Hult. Atlas över växter utbr. (1950) tab. 1721.—*A. inodora* auct. non Mill.; MB. Fl. taur.-cauc. II, 245; Fedtsch. Perech. Rast. Turk. IV, 192; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 351.—*A. marschalliana* Spreng. Syst. veg. III (1826) 496; Grossh. Fl. Kavk. IV, 142; Kraschennin. in Spisok Rast. Gerb. Fl. SSSR, XI, 46; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2772; Grossh. Opred. Rast. Kavk. 465.—*A. sericophylla* Rupr. in Beitr. Pflanzenk. Russ. Reich. II (1845) 41; Perf. Fl. Sev. Kraya, III.—*A. sosnovskyi* Krasch. in Grossh. Opred. Rast. Kavk. (1949) 465 nom.—*A. sosnovskyi* Krasch. ex Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 178.—*A. eldarica* Rzazade in Izv. Akad. Nauk Azerb. SSR, 3 (1955) 22.—*A. araratica* Krasch. ex Novopokr. op. cit. 179.—*Oligosporus campestris* (L.) Cass. in Dict. Sc. Nat. XXXVI (1826) 25.—Exs.: GRF No. 1025 (sub *A. inodora*), 3287a, b, c, (sub *A. marschalliana* Spreng.).

Perennial. Whole plant sparsely covered with short, semiappressed hairs, sometimes almost glabrous; root vertical, woody, with sterile, leafy shoots. Flowering shoots strong, (20)50–65 cm high, usually erect, ribbed, brown or slightly reddish, branched. Leaves of sterile shoots and lower cauline leaves long-petiolate, (3)4–8(10) cm long, twice or, less often, thrice pinnately incised, lobes narrowly linear, most often 3–10(20) mm long, subacuminate; middle and upper cauline leaves sessile, more simply divided, usually pinnately cut or divided into 3–7 lobes, uppermost leaves bracteal, small, narrowly linear, sometimes with 2–4 lobules at base. Capitula numerous, erect, sessile, ovate,

1.5–3.0(4.0) mm long and 1.5–3.0 mm in dia, crowded on branches in more or less dense or lax spikes forming elongated, rather narrow, conical-paniculate inflorescence. Outer involucre bracts oval, almost round, convex, green on outer side, glabrous or hairy; inner bracts slightly larger, oblanceolate-oblong, smooth, glabrous, with wide scarious border. Peripheral florets pistillate, fertile, 7–9, their corollas narrowly tubular, with 2 teeth; stigma lobes exerted from corolla tube, narrowly linear, erect or weakly divergent; disk florets staminate, 7–9, their corollas conical, glabrous; anthers on short filaments, lanceolate-linear, apical appendages of anthers obtuse, basal appendages short, subacute, stigma of abortive pistil with 2 short, erect lobes. Achenes to 1 mm long, ovoid, terete, dark brown. Flowering August.

554 Steppe meadows, sandy steppe, pine forests, weed in old fields, along river valleys on terraces, forest, steppe and forest-steppe zones and rubbly mountain slopes of.—*European part*: Ladoga-Ilmen, Dvina Pechora, Upper Dnieper, Upper Volga, Volga-Kama, Upper Dniester, Middle Dnieper, Volga-Don, Trans-Volga, Lower Volga, Lower Don, Black Sea Region, Bessarabia, Crimea; *Caucasus*: Eastern and Southern Transcaucasia, Dagestan, Talysh; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region. *General distribution*: Atlantic Europe, Central Europe, Balkans-Asia Minor, North America. Described from Western Europe. Type in London.

Note. Based on a study of the variation, the following varieties can be distinguished:

1. Var. *marschalliana* (Spreng.) Poljak.—With highly crowded spicate capitula on branches forming a rather narrow, spicate-paniculate inflorescence; distributed in Kazakhstan steppe.

2. Var. *sericophylla* (Rupr.) Poljak.—Distinguished by dense sericeous pubescence; distributed on sand dunes at the mouth of the Northern Dvina River.

3. Var. *sosnovskyi* (Novopokr.) Poljak.—Distinguished by smaller, subglobose capitula and somewhat elongate branches; distributed in western Caspian Region (Dagestan, eastern Transcaucasia).

4. Var. *araratika* (Novopokr.) Poljak.—With small, narrowly ovate capitula, glandular or hairy involucre bracts, and narrowly linear leaf lobes; found in Armenia.

Economic Importance. According to the data of L. Kazakevich and O. Sobolevskaya (1928), the yield of essential oil from the air-dried plant matter is 0.028–0.07%. Oil constants: D^{20} —0.8696; acid number—5.59; ester number—16.77; ester number after acetylation—57.49.

According to I.V. Larin (1956), var. *marschalliana* is a plant of average quality in regard to its fodder value.

107. **A. tomentella** Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 1 (1866) 351; Fedtsch. Perech. Rast. Turk. IV, 192; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2772.—*A. inodora* MB. ssp. *tomentella* (Trautv.) Krasch. in herb.—**Exs.:** GRF No. 3186.

Perennial. Tap root sometimes branched, many-headed in old specimens, to 3 cm thick. Stems few or numerous, 35–60(70) cm high, at base woody, densely covered with fine white hairs. Leaves sericeous-gray or pubescence absent (var. *subglabra* Krasch.), lower leaves petiolate, middle and upper leaves sessile; all leaves oblong, once or almost twice pinnately incised, their lobes broadly linear or linear-lanceolate, 0.5–3.0 cm long and 0.3–1.5 mm wide, their terminal lobe 3-parted; uppermost leaves simpler 3–5 lobed, with 1–3 linear auricles on each side; bracteal leaves linear, sometimes with 1–2 secondary lobes at base. Inflorescence oblong, rather narrow panicle. Capitula short-pedunculate, oblong-ovoid, 2.5–3.0 mm long and 1.5 mm in dia, on main branches in short racemes or head. Involucral bracts oval, 555 with scarious margin; outer bracts hairy; inner bracts glabrous. Peripheral florets pistillate, 7, their corollas narrowly tubular, punctate-glandular; stigma lobes linear, erect, or divergent; disk florets staminate, 5, their corollas conical; anthers lanceolate-linear, their apical appendages round, long-acuminate, basal appendages short, subobtus; stigma of abortive pistil not lobed, funnel-shaped. Flowering August.

Sands at northern edge of desert zone.—*Soviet Central Asia:* Aralo-Caspian Region, Lake Balkhash Region. Endemic. Described from Chu and Sarysu rivers. Type in Leningrad.

108. **A. bargusinesis** Spreng. Syst. veg. III (1826) 493; Kryl. Fl. Zap. Sib. XI (1949) 2776.—*A. brealis wildenovii* Bess. in Linnaea, XV (1841) 96.—*A. pallasii* Willd. in herb. No. 15342.

Perennial. Root woody, distinctly thickened in upper part, with fascicles of basal leaves. Stem solitary, erect, glabrous, weakly ribbed, yellowish-green, stem 40–50 cm high. Leaves usually glabrous or grayish-pubescent from appressed hairs, long-petiolate; lower cauline leaves 10–15 cm long and 2–3 cm wide, twice pinnately incised, secondary lobes 10–15 mm long and 1–2 mm wide, linear-lanceolate, short acuminate, spinescent or falcate; upper cauline leaves simpler, pinnately cut; bracteal leaves pinnate, ternate, or undivided, often distinctly exceeding inflorescence. Capitula broadly ovate, 4–5 mm long and 3–4 mm in dia, with flat broad base, erect, on short peduncles on lower appressed branches, but upper capitula borne along entire main axis of inflorescence on long peduncles in narrowly oblong-paniculate inflorescence. Involucral bracts glabrous, lustrous, with white scarious border; outer bracts smaller, oval, acuminate, inner bracts

elliptical or lanceolate, subobtus. Peripheral florets pistillate, fertile, 15, their corollas narrowly tubular, with 2 teeth; stigma lobes narrowly lanceolate, subacuminate, divergent; disk florets staminate, numerous (25–27), their corollas narrowly conical; anthers on short filaments, linear, apical appendages of anthers oblong, acute, basal appendages short, obtuse; stigma of abortive pistil not lobed. Achenes 1.5 mm long, narrow, ovate, somewhat flat, apically attenuate, finely ribbed, brown. Flowering August.

On mountain and steppe slopes, gravel beds in forest and alpine tundra zones.—*European part*: Volga-Kama (southern Urals); *Western Siberia*: Altai; *Eastern Siberia*: Dauria. Endemic. Described from Barguzin District. Type in Berlin.

109. **A. ledebouriana** Bess. in Bull. Soc. Nat. Mosc. VIII (1835) 39; DC. Prodr. VI, 99; Ldb. Fl. Ross. II, 562.—*A. borealis* σ . *ledebouri* Ldb. *ibid.* 567.

Whole plant with dense, long, semierect, white, hairs, later sometimes subglabrous. Root woody, vertical, rather thick, with
 556 perennial, woody, approximate, erect shoots covered with remnants of leaf petioles and with rosettes of leaves. Stems 2–3 or solitary, 20–35(40) cm high and up to 3 mm thick, strong, straight, brownish, simple, less often branched, leafy. Basal leaves and leaves of sterile shoots petiolate, 4–6 cm long, twice pinnately incised, terminal lobes lanceolate-linear, most often about 1.5 mm wide, acute; middle cauline leaves short-petiolate or sessile, with pinnately cut auricles at base; lamina pinnately cut, upper bracteal leaves simple, short, narrowly linear. Capitula pedunculate, subglobose, 3–4 mm long, in lax racemes on short branches forming short pyramidal panicle. Involucral bracts oval, with wide scarious margin; outer bracts densely hairy; inner bracts glabrous. Peripheral florets pistillate, 9, their corollas narrowly tubular, with 2 teeth, broadened at base, in upper part purple-violet; stigma lobes exserted from corolla tube, narrowly linear, obtuse, recurved; disk florets staminate, 16–18, their corollas narrowly conical; anthers on shorter filaments, linear-lanceolate, apical appendages of anthers acute, basal appendages considerably shorter, subacute; stigma of abortive pistils funnel-shaped, not lobed. Achenes to 2 mm long, oblong-ovoid, attenuate at apex, finely ribbed, blackish-brown. Flowering August. (Plate XXIX, Fig. 2).

Sandy coasts.—*Eastern Siberia*: Dauria (Lake Baikal) Endemic. Described from eastern Siberia. Type in Leningrad.

110. **A. pannosa** Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 3 (1936) 347.

Perennial. Plant sericeous-shaggy from long appressed hairs. Stems almost simple, 15–28 cm high. Basal and lower cauline leaves 4–7 cm long, long-petiolate, petioles winged at base, lamina broadly oblong or broadly ovate, with 1–2 lobes on each side, lobes undivided, lanceolate or broadly lanceolate or pinnately divided, broadly cuneate at base; secondary lobes 3–7 mm long, linear or broadly lanceolate, short-acuminate, undivided or toothed; sometimes basal leaves also undivided, lobate or toothed; upper cauline leaves sessile, pinnately divided, with linear lobes, apical leaves undivided, linear. Capitula broadly ovate or subglobose, 2–3 mm in dia, on short branches, in narrow, long (10–15 cm long) panicle. Involucral bracts bulged, with scarious border; outer bracts oval or elliptical, densely hairy; inner bracts oblong-lanceolate or narrowly elliptical, weakly hairy, sometimes glabrous. Peripheral florets pistillate, 10, obconical, their stigma lobes linear, divergent; disk florets staminate, 8–9, their corollas conical; anthers lanceolate-linear, apical appendages of anthers acute, basal appendages short, subobtusate; stigma of abortive pistils funnel-shaped, not lobed. Achenes 557 to 2 mm long, flat, ovate, attenuate at apex, brownish-black. Flowering August to September. (Plate XXVIII, Fig. 2).

Seacoasts and stony slopes.—*Far East*: Ussuri. Endemic. Described from coast of Sea of Japan between Vladivostok and mouth of Amur River. Type in Leningrad.

Series 7. Borealis Krasch. ex Poljak.—Tussocky perennials; inflorescence simple, spicate or narrow, racemose-paniculate.

111. **A. borealis** Pall. Reise, III, Anhanf. (1776) 735, tab. H, h, f, l; Willd. Sp. pl. III, 1839; Bess. in Bull. Soc. Nat. Mosc. VIII, 80; DC. Prodr. VI, 98; Ldb. Fl. Ross. II, 567 p. p.; Maxim. Pr. Fl. Amur. 158; Maxim. in Bull. Acad. Sc. Pétersb. VIII, 524; Kryl. Fl. Alt. III, 636; Kom. Fl. Manchzh. III, 659; Nakai, Fl. Korean. 33; Rydb. North. Am. Fl. 34, part 3, 256 p. p.; Pampan. in Nuov. Giorn. Bot. Ital. n. s. XXXIV, 641; Kom. Fl. Kamch. III, 146; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1035; Krascheninn. in Kryl. Fl. Zap. Sib. XI, 2777.—*A. violacea* Ldb. in Mém. Acad. Sc. Pétersb. V (1812) 567; Ldb. Fl. Alt. IV, 78.—*A. borealis* var. *purshii* Bess. in Hook. Fl. Bor. am. I (1833) 326; Bess. op. cit. 80.—*A. borealis* Pall. var. *spithamaea* (Pursh) Torrey and Gray, Fl. North Am. Fl. 2 (1843) 417; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, X, 96.—*A. spithamaea* Pursh, Fl. Amer. Sept. II (1814) 522; Rydb. op. cit. 255.—*A. campestris* ssp. *spithamaea* Hall and Clements. The Phylog. Method (1923) 123.—*A. campestris* ssp. *borealis* Hegi, Ill. Fl. VI, 2 (1929) 669.—*A. remosa* Sugaw. Pl. of Saghal. (1934) 364.—*A. camtschatica* Schlechtd. in Herb. Berol.—Exs.: GRF No. 3185a, b.

Perennial. Root thick (to 1.5 cm), many-headed, with very short, erect, approximate perennial shoots, covered with thickened bases of leaf petioles and with rosettes of leaves forming rather compact, small tussocks. Stems few or solitary, 8–25(35) cm high, erect or somewhat bent, simple or branched, more or less hairy or subglabrous, sometimes violet. Leaves entire, densely hairy at base, on both sides or only beneath, later glabrescent; lower cauline leaves and leaves of sterile shoots long-petiolate, 2–6–10 cm long, twice or almost thrice pinnately incised, lobes lanceolate-linear or linear, 2–10 mm long and 0.5–1.5 mm wide, short-acuminate; middle cauline leaves less divided, often simple pinnate or palmate or sometimes even undivided, linear; apical leaves bracteal, usually undivided, linear, considerably exceeding inflorescence and short lateral branches. Capitula subglobose, 3–4 mm in dia, borne directly on main stem or on peduncles, gradually longer
 558 downward forming simple raceme or even compact and strongly shortened racemes on lateral branches of narrow racemose or partly racemose-paniculate inflorescence. Involucral bracts densely hairy or glabrous; outer bracts oval, usually brownish-purple, inner bracts somewhat larger, broadly oval, with white scarious margin. Peripheral florets pistillate, 15–17, their corollas small, tubular; stigma lobes linear, obtuse, divergent; disk florets staminate, 17–20, their corollas narrowly conical, glabrous or in upper part hairy, often purple, anthers linear, apical appendages of anthers acute, rather large, basal appendages very short, subobtuse; stigma of abortive pistil funnel-shaped, not lobed. Achenes about 2 mm long, oblong-ovate, somewhat flat, blackish-brown. Flowering August. (Plate XXIX, Fig. 3).

Dry sandy banks, well-drained river terraces, slopes of uplands in arctic zone, as well as stony and rubbly slopes of mountains in alpine zone, descending to limits of forest zone.—*Arctic*: Arctic Europe, Novaya Zemlya, Arctic Siberia, Chukotka, Anadyr; *Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, Yenisei, Dauria, Lena-Kolyma; *Far East*: Sakhalin, Kamchatka. *General distribution*: Scandinavia, North America. Described from lower reaches of Ob River. Type in London.

Note. This species is characterized by great variation in the pubescence, whereby young plants are often whitish from an abundance of hairs, but older plants are often subglabrous; the inflorescence is sometimes paniculate or spicate, when the capitula are more or less crowded on very short peduncles. The degree of leaf cutting also varies; the apical leaves are either undivided or partly 3-lobed or even pinnatisect. It is possible to distinguish:

1. Var. *ledebouri* Bess.—distinguished by pinnately cut basal leaves and simple racemose inflorescence;

2. Var. *mertensii* Bess.—with twice or thrice pinnately incised basal leaves and capitula that are crowded in lax panicle with longer branches.

112. **A. henriettae** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 175.

Perennial. Root woody, rather thick, with strongly shortened perennial shoots bearing rosettes of leaves forming compact velutinous tussocks scarcely 5–8 cm in dia with short (1–3(7) cm high), erect stems. Leaves small, covered with long, usually dense hairs; petioles thickened at base; lamina pinnatifid, lobes 2–3 on each side, small, 2–3 mm long, fleshy, linear or lanceolate, subacute. Capitula globose, 4–5 mm in dia, in dense, terminal head. Involucral bracts oval, pilose, with broadly scarious margin. Receptacle convex, glabrous. Peripheral
559 florets pistillate, fertile, 17–32, their corollas narrowly tubular or narrowly goblet-shaped-tubular with 3–5 teeth, in upper part purple-violet, glabrous or weakly hairy; stigma lobes exerted from corolla tube, linear-up-right; disk florets (12–19) staminate, their corollas narrowly goblet-shaped-conical with 5 teeth, purple-violet, anthers lanceolate-linear, apical appendages round, acuminate, basal appendages short, round; stigma of abortive pistil funnel-shaped, indistinctly lobed. Flowering August.

Well-drained, clayey slopes in arctic zone.—*Arctic*: Novaya Zemlya, Arctic Siberia (islands of Kara Sea, De Long islands). Endemic. Described from Henriette Island. Type in Leningrad.

113. **A. limosa** Koidz. in Sugaw. Pl. Saghal. (1937) 303; Honda Nom. pl. Japon. 342; Sugaw. Ill. Fl. Saghal. IV (1940) 1825.—**Ic.**: Sugaw. ibid. tab. 824.

Perennial. Root slender, vertical, with solitary, perennial, very short shoots covered with leaf petioles and bearing rosette of leaves. Stem solitary, 20–28 cm high, erect, glabrous, brown or violet-brown, sparsely leafy, simple or branched, with more or less short, upright, flowering branches. Leaves glabrous, smooth; lower cauline leaves and leaves of sterile shoots 2–3 cm long, long-petiolate with petioles strongly thickened at base, lamina oblate or almost round, twice pinnately cut, lobes linear or narrowly lanceolate-linear, often 3–7 mm long, acute; middle cauline leaves less compound, uppermost leaves bracteal, short, simple, narrowly linear. Capitula broadly ovoid, 4–5 mm long, upright, crowded, on more or less long peduncles, borne on main stem or in depauperate racemes on branches, forming narrow, linear, racemose-

paniculate inflorescence. Involucral bracts glabrous, with wide scarious margin; outer bracts oval or elliptical, inner bracts considerably larger, narrowly elliptical or narrowly oblanceolate.

Mud volcanos.—*Far East*: Sakhalin? Endemic. Described from southern Sakhalin. Type in Japan.

Note. The available material is insufficient and precludes the possibility of describing the flowers. The original description by the author of the species is incomplete.

114. **A. pycnorhiza** Ldb. Fl. Alt. IV (1833) 79; Bess. in Bull. Soc. Nat. Mosc. VIII, 77; DC. Prodr. VI, 98; Ldb. Fl. Ross. II, 567; Kryl. Fl. Alt. III, 636; Kryl. Fl. Zap. Sib. XI, 2775.—*A. borealis* var. *ledebourii* Fedtsch. Perech Rast. Turk. IV (1911) 192.—*A. depauperata* Krasch. in Sistemat. Zam. Gerb. Tomsk. Univ. 1–2 (1949); Kryl. Fl. Zap. Sib. 2777.—**!c.**: Ldb. **!c.** pl. Fl. Ross. V, t. 473.

560 Perennial. Root 1.0–1.5 cm thick, woody, many-headed, with few strongly reduced, thick, perennial shoots (with rosette of leaves), forming rather dense tussocks. Fertile stems few, (5)10–18(25) cm high, erect, simple, hairy, later subglabrous, stramineous. Leaves densely covered with semiappressed long hairs; basal and lower cauline leaves petiolate, 2–6 cm long and 1–2 cm wide, ovate or lanceolate, once or twice pinnately incised, lobes 3–6 mm long and 1.0–1.5 mm wide, lanceolate, subulately spinescent; middle and upper leaves sessile, smaller and more or less divided to simple pinnate; uppermost leaves undivided, usually not rising above lateral branches of inflorescence. Capitula broadly ovoid, 2.5–4.0 mm in dia, upright, in simple racemose-spicate or racemose-paniculate inflorescence; lower capitula often remote on rather long peduncles, but upper ones sessile. Involucral bracts sparsely hairy or glabrous, smooth; outer bracts oval, acute; inner bracts broadly elliptical or almost round, obtuse or somewhat acuminate with scarious border, and brownish longitudinal stripe in upper part. Peripheral florets pistillate usually 15, their corollas narrowly tubular, often enlarged at base; stigma lobes narrowly linear, subacuminate, upright; disk florets staminate, 10–15, their corollas conical, punctate-glandular, glabrous, sometimes with sparse hairs; anthers on short filaments, linear, apical appendages acute, basal appendages short, subacute; stigma of abortive pistil short, linear, not lobed. Achenes 1.0–1.2 mm long, ovoid, somewhat flat, angular-ribbed, dark brown. Flowering July to August.

Stony steppe slopes and valleys, upper part of mountains or in alpine zone.—*Western Siberia*: Altai (south-east); *Soviet Central Asia*: Dzhungaria-Tarbagatai. *General distribution*: Mongolia. Described from Altai. Type in Leningrad.

Note. In Tarbagatai and part of the Altai, we find var. *depauperata* (Krasch.) Poljak. with larger capitula, partly in a spicate arrangement, and bracteal leaves that project from the inflorescence.

Series 8. Scopariae Krasch.—Annuals or biennials; leaves divided into narrowly filiform or filiform lobes; capitula ovoid.

115. **A. scoparia** W. and K. Pl. rar. Hung. I (1802) 66, t. 65; Ldb. Fl. Alt. IV, 87; Bess. in Bull. Soc. Nat. Mosc. VIII, 92; DC. Prodr. VI, 99; Ldb. Fl. Ross. II, 569; Boiss. Fl. or. III, 364; Hook. Fl. Br. Ind. 322; Kryl. Fl. Alt. III, 637; Fedtsch. Perech. Rast. Turk. IV, 192; Hegi, Ill. Fl. VI, 2, 670; Grossh. Fl. Kavk. IV, 139; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 353; Kryl. Fl. Zap. Sib. XI, 2778; Poljak. in Majeviski, Fl. 584.—*A. scopariaeformis* M. Pop. in Pochv. Eksp. Bass. rr. Syr-Dari i Amu-Dari, 1 (1915) 50.—*A. scoparioides* Grossh. in Tr. po Geob. Obsl. Pastbishch Azerb. 2 (1929) 69; Grossh. Fl. Kavk. IV, 139; Grossh. Opred. Rast. Kavk. 463.—*A. paniculata* Bess. in Mém. Acad. Sc. Pétersb. V (1945) 471, non Lam.—
561 *Oligosporus scoparius* (W. and K.) Less. in Linnaea, IX (1834) 191.—
Exs.: GRF Nos. 623, 3177a, b.

Annual or biennial. Root slender, straight, vertical. Stem 30–70 cm high, solitary, less often 2–3, erect, pubescent, later glabrous, reddish-violet or brown, strongly branched in middle and upper parts, with divergent branches. Young leaves pubescent, older ones glabrous; lower leaves petiolate, twice or thrice pinnately incised into linear-lanceolate-acute lobes, withering before anthesis; middle cauline leaves sessile, 1–4 cm long, with narrowly linear or filiform-linear lobes. Capitula small, 1.5–2.0 mm long, ovate or broadly ovate, on short peduncles, divergent or drooping, on branches in secund racemes forming pyramidal panicle. Involucral bracts glabrous, with scarious margin; upper bracts oval, inner larger, green, oblong or broadly lanceolate, glabrous, glaucous. Peripheral florets pistillate, 6, their corollas narrowly tubular, stigma lobes narrowly linear, acuminate, divergent; disk florets 6, staminate, their corollas conical, anthers linear, stigma of abortive pistil not lobed. Achenes 0.6 mm long, ovoid, somewhat flat, finely ribbed, brown. Flowering August.

Alkaline steppe meadows, light sandy loamy and sandy soils, as weed in fields, pastures, old fields, open pine groves, and also in irrigated fields, along river valleys on rubbly slopes, in forest-steppe and desert zones and also in lower mountain zone in steppes.—
European part: Karelia-Lapland, Dvina-Pechora, Ladoga-Ilmen, Upper Dnieper Baltic Region, Upper Volga, Volga-Kama, Volga-Don, Upper Dniester, Middle Dnieper, Bessarabia, Black Sea Region, Lower

Don, Lower Volga, Trans-Volga, Crimea; *Caucasus*: Ciscaucasia, Eastern, Western and Southern Transcaucasia, Dagestan, Talysh; *Western Siberia*: Upper Tobol, Irtysh, Altai, Angara-Sayans, Lena-Kolyma, Dauria; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Kyzyl-Kum, Kara-Kum, Syr-Darya, Amu-Darya, Tien Shan, Pamiro-Alai Region. *General distribution*: Atlantic and Central Europe, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from Hungary. Type in Vienna.

Note. One can distinguish var. *scopariiformis* (M. Pop.) Poljak. with long, strongly divergent branches and a small number of flowers (pistillate florets 1–2, staminate disk florets—2–4); found in the deserts of Uzbekistan and Turkmenia.

Economic Importance. The above-ground parts of the plant contain 0.09–1.1% essential oil. According to the data of L. Kazakevich and O. Sobolevskaya (1928), the oil from a plant collected in the Astrakhan Region had the following constants: $D=0.913$; $n_D^{20}=1.49$; acid number—3.32; ester number—14.50; ester number after acetylation—43–45. The oil contained up to 4% α -pinene, up to 30% β -pinene, about 10% myrcene. According to the data of A. Katz (1938), the oil contains up to 3% aldehydes and ketones and 1.5% phenols.

According to the data of V.A. Vyshensky (1930), the oil from a plant collected in Turkmenia (probably var. *scopariiformis* (M. Pop.) Poljak.) had the following constants: $D=0.8695$; $\alpha=1.3^\circ$; $n=1.4894$; 562 acid number—0.16; ester number—32.3; ester number after acetylation—53.17. The oil contained apiol. In Vyshensky's opinion, the oil is of little industrial interest, but, according to M.I. Goryaev (1956), it can be used in perfumery.

116. **A. demissa** Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, c, (1936) 348.

Annual or biennial. Root slender, vertical. Stem 5–20 cm high, violet, sometimes greenish, more or less densely hairy, basally branched, lower branches prostrate in lower part, ascending above, usually arcuately bent, fertile. Leaves covered with long appressed, white hairs; basal and lower cauline leaves petiolate, with expanded semiamplexicaul petioles, 1.5–2.0 cm long and 1.0–1.5 cm wide, lamina broadly oblong or broadly ovate, twice pinnately incised, lobes 2–4 mm long, linear-lanceolate, with short, stiff, acuminate apices; upper cauline and apical leaves sessile, 5–10 mm long, simple pinnate, with linear lobes. Capitula numerous, erect, sessile or on short peduncles, ovoid-campanulate, 2 mm long and 1.5 mm in dia, remote, in lax racemose-paniculate inflorescence. Involucral bracts glabrous, glaucous, convex dorsally, greenish, with more or less wide scarious border, pale, sometimes

violet, outer bracts oval-deltoid, inner bracts broadly lanceolate. Peripheral florets pistillate, rather numerous (19), their corollas narrowly tubular, with one very short tooth, stigma lobes filiform-linear, acuminate, divergent; disk florets staminate, usually 5, their corollas narrowly conical, anthers linear; stigma of abortive pistils not lobed, funnel-shaped. Achenes 0.6–0.7 mm long, flat, ovoid, finely ribbed, brown. Flowering August. (Plate XXIX, Fig. 1).

Sandy coasts and alpine deserts, sometimes near irrigated areas.—*Soviet Central Asia*: Pamiro-Alai Region (western Pamir). *General distribution*: Tibet. Described from banks of Kuku-Nor River. Type in Leningrad.

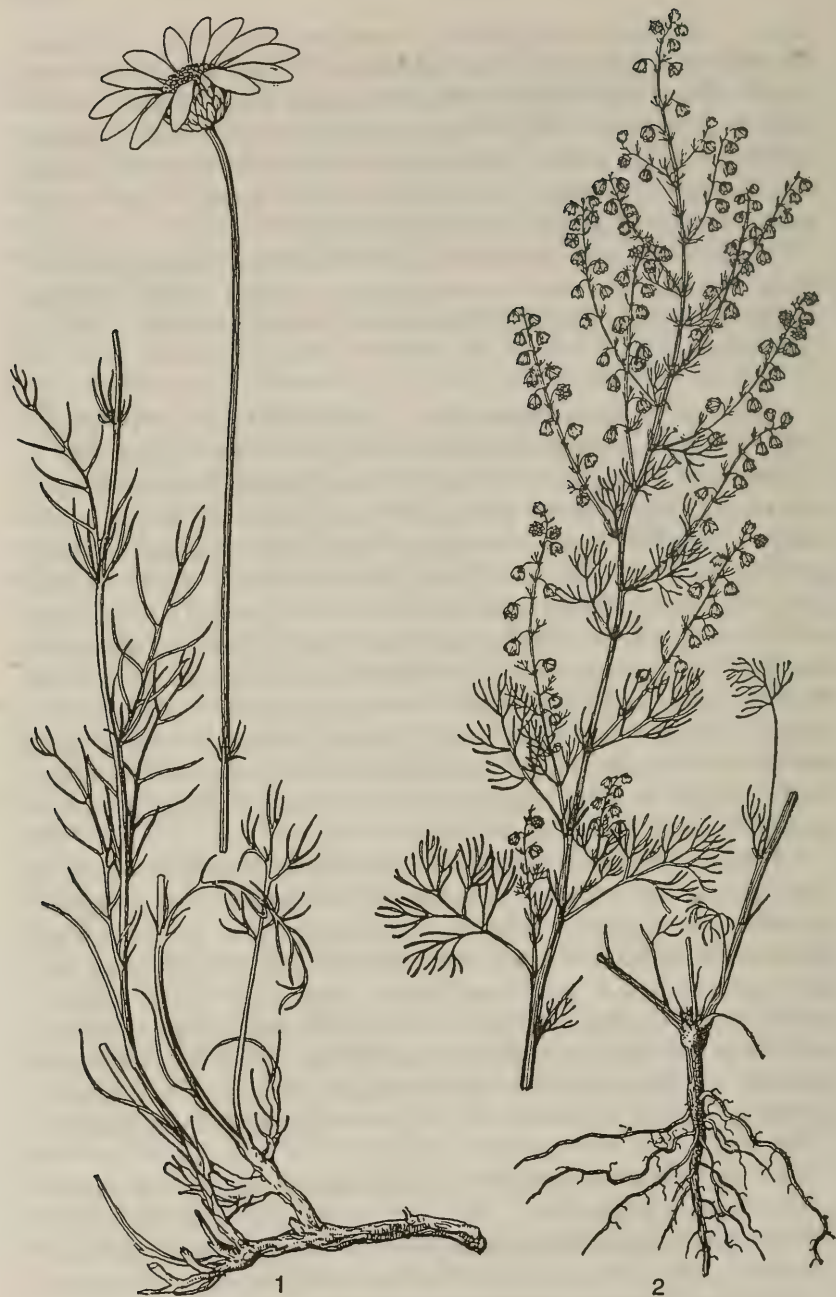
Subgenus 3. Seriphidium (Bess.) Rouy. Fl. France. VIII (1903)

298.—*Seriphidium* Bess., Sect. in Bull. Soc. Nat. Mosc. I (1828) 222.—Capitula with homogamous florets; involucre small, ovate or narrowly cup-shaped, 3–6-whorled. Involucral bracts imbricate, with scarious margin, innermost bracts considerably larger than outer ones, partly covering each other by their apices, hence involucre appearing like closed receptacle. Florets 2–10, bisexual, cleistogamous, their corollas tubular, with 5 teeth, yellow, less often pinkish; anthers lanceolate-linear, as long as filaments. Apical appendages of anthers subulate or narrowly linear, basal appendages very short, roundish; “antheropodia” distinct, round; style shorter than or as long as stamens, style lobes short, linear, upright, truncate, with short, erect ciliate hairs throughout upper margin. Achenes flat-ovoid, sulcate; pappus absent; common receptacle very small, conical, glabrous.

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Perennial shrubs or semishrubs with woody perennial shoots at base, or very rarely annuals, at beginning of vegetative period densely covered with simple or bifid arachnoid hairs, later glabrescent or glabrous; lower cauline leaves often twice or thrice pinnately incised into narrowly linear or filiform lobes, upper leaves more simple. Inflorescence paniculate or less often spicate-paniculate. There are more than 100 species in nature, distributed in the Mediterranean countries and extending up to the eastern parts of Soviet Central Asia. In the flora of the Soviet Union, 58 species belong to this subgenus.

1. All leaves simple, entire or pinnate-short lobate, or even with 3–5 teeth at apex 2.
- + Lower cauline leaves ternate or twice to four times pinnately incised 4.
2. Lower cauline leaves with 3–5 broadly linear teeth at apex, others linear, entire 172. *A. deserti* Krasch.
- + All leaves pinnately short-lobed or subentire 3.



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Plate XXVII.

1 — *Trichanthemis aulieatensis* (B. Fedtsch.) Krasch., habit. 2 — *Artemisia anethifolia* Web., habit.

3. Lateral segments of leaves simple, round, sometimes slightly elongated or even divided into 2–3 small, round lobes; sometimes leaves even entire or with broad, obtuse teeth; uppermost leaves bracteal, small, linear. Capitula ovate, up to 5 mm long, with 3–4 florets 170. **A. santolina** Schrenk.
- + Lateral segments deltoid-oval or oval, with very short decurrent rachis, simple or twice or thrice pinnately incised lobes; upper bracteal leaves scaly, broadly linear; capitula oblong, up to 4 mm long, with 5–6 florets 171. **A. lobulifolia** Boiss.
- 4(1). Middle and partly lower cauline leaves ternate; pubescence of hairs short, stiff, appressed or long, and erect 5.
- + Lower leaves twice or thrice pinnately cut; hairs arachnoid, flexuous 7.
5. Annual or biennial, with slender, readily peeling bark; hairs dense, long, mostly squarrose 174. **A. leucodes** Schrenk.
- + Perennials with thick woody root; hairs short, appressed 6.
6. Leaves of sterile shoots and lower cauline leaves 1.5–2.0 cm long, terminal lobes 4–6 mm long; capitula 5–6 mm long, densely pubescent 173. **A. juncea** Kar. and Kir. var. **macrosciadia** Poljak.
- + Leaves larger; capitula usually less hairy, up to 4.0–4.5 mm long 173. **A. juncea** Kar. and Kir.
- 7(4). Stems at flowering glabrous, blackish-purple or deep dark brown, lustrous 154. **A. turanica** Krasch.
- + Stems lighter in color; pubescent to different degrees, less often glabrous 8.
8. Short, up to 35 cm high, strongly branched shrub forming compact, stiff pulvinate crown; flowering shoots almost horizontally divergent, almost prickly at end of vegetative period 166. **A. sieberi** Bess.
- + Plant with characters otherwise 9.
9. Capitula few, clustered in usually compact, oblong or subglobose, remote or approximate spikes 10.
- + Capitula approximate or remote on branches but not forming compact spikes 14.
10. Lower leaves round, thrice- or almost thrice pinnately cut; semishrub, strongly branched 11.
- + Lower leaves ovate, twice pinnately cut; herbaceous perennials 12.
11. Plant 35–45 cm high, initially densely pubescent, later partly glabrous or subglabrous 167. **A. lehmanniana** Bge.
- + Plant 12–30 cm high, whitish-tomentose up to end of vegetative period 167. **A. lehmanniana** Bge. var. **skorniakovii** (Winkl.) Poljak.

12. High-mountain (alpine) plants with strongly reduced underground, partly aerial, woody shoots forming rather compact tussock; fertile stems 4–10(15) cm high, with simple spicate inflorescence 128. **A. rhodantha** Rupr.
 + Mountain plants, partly in foothills, with lax tussock and branched, much taller stems 13.
13. Fertile stems 15–35 cm high; lower cauline leaves short-petiolate, 2–3 cm long 127. **A. compacta** Fisch.
 + Stems 50–60 cm high; leaves 4–5 cm long 129. **A. prolixa** Krasch. ex Poljak.
- 14(9). Inflorescence simple, spicate or spicate-racemose 15.
 + Inflorescence paniculate 19.
15. Lower leaves simple or partly almost twice pinnately cut; plant usually 5–15 cm high 10.
 + Lower leaves always pinnate; plant 20–35 cm high 18.
- 566 16. Plants 15(25) cm high, with lax, weakly developed tussock 132. **A. korovinii** Poljak.
 + Plants 5–15 cm high, forming compact tussock 17.
17. Lower leaves once pinnately cut; capitula in simple spicate inflorescence 131. **A. knorringiana** Krasch.
 + Lower leaves once or twice pinnately cut; capitula in spicate or racemose inflorescence 123. **A. nitrosa** Web. ex Stechm. var. **gobica** Krasch.
18. Entire plant whitish-tomentose; lower leaves 2.5–4.0 mm long; capitula up to 2.5 mm long 130. **A. dubjanskyana** Krasch. ex Poljak.
 + Plant glaucescent-green, subglabrous; lower leaves up to 1.0–1.5 cm long; capitula usually smaller, up to 2 mm long 168. **A. vachanica** Krasch. ex Poljak.
 ++ Plant tomentose, later subglabrous; lower leaves 1–3 cm long; capitula up to 3 mm long 158. **A. sogdiana** Bge.
- 19(14). Lower cauline leaves once pinnately cut or in part twice pinnately cut 20.
 + Lower cauline leaves twice to four times pinnately cut 29.
20. Inflorescence; usually narrow, branches mostly short, 1–2(3) cm long 21.
 + Inflorescence more or less spreading, branches longer, obliquely upright or almost horizontal 24.
21. Plant glabrous or subglabrous; leaves divided into filiform-linear lobes, up to 5–10 mm long 136. **A. lessingiana** Bess.
 + Plant grayish, more or less densely pubescent; terminal lobes of leaves linear or narrowly lanceolate-linear 22.

22. Branches of inflorescence horizontally divergent or even drooping; plant pleasantly aromatic 135. **A. terrae-albae** Krasch. var. **suaveolens** Poljak.
 + Branches adpressed to stem or obliquely upright 23.
23. Terminal lobes of leaves mostly up to 1 mm wide and 4–12 mm long; plant whitish-tomentose up to end of vegetative period, endemic to Altai 143. **A. amoena** Poljak.
 + Terminal lobes shorter and narrower; plant grayish-green, partly with caducous pubescence 139. **A. sublessingiana** Krasch. ex Poljak. var. **polistichum** Poljak.
- 24(20). Stems branched from base or lower part, with long (lower branches up to 10–25 cm long) virgate branches 142. **A. kaschgarica** Krasch.
 + Stems always branched in upper part 25.
25. Plants grayish-green, not densely pubescent, later subglabrous or weakly pubescent, green or glaucescent-green 26.
 + Plants whitish-tomentose, later glabrescent 27.
26. Fertile stems 30–50(65) cm high; inflorescence rather wide, paniculate with long, rather strongly divergent branches; lower cauline leaves 3–5 cm long, their terminal lobes up to 4.5 mm long 123. **A. nitrosa** Web. ex Stechm.
 + Fertile stems 7–18(20) cm high; inflorescence oblong, paniculate, with obliquely upward-spreading branches; lower cauline leaves 1.0–2.5 cm long; their terminal lobes 2–4 mm long 145. **A. cina** Berg. ex Poljak. var. **mogoltavica** Poljak.
27. Lower leaves pinnately cut, lateral segments entire or more or less deeply divided into 2–4 lanceolate, acute lobes; inflorescence narrow, lax, pyramidal panicle; plants of clayey salt marshes and alkali soils 124. **A. scopaeformis** Ldb.
 + Lower cauline leaves once or twice pinnately cut, terminal lobes narrowly linear; panicle rather wide, usually with strongly divergent or upward-spreading branches; plants of brown-desert soils and desert sands 28.
28. Stems 12–25 cm high; capitula 3.0–4.5 cm long; involucre bracts convex, punctate-glandular 156. **A. kemrudica** Krasch.
 + Stems 15–30 cm high; capitula 2–3 mm long; involucre bracts not strongly curved, eglandular 135. **A. terrae-albae** Krasch.
 ++ Stems 30–40 cm high; capitula 2–3 mm long, eglandular 135. **A. terrae-albae** Krasch. var. **massagetovii** Krasch.
- 29(19). Lower cauline leaves thrice or four times pinnately cut 169. **A. baldshuanica** Krasch. and Zapr.
 + Lower leaves twice or thrice pinnately cut 30.
30. Lower leaves mainly thrice pinnately cut 31.

- + Lower leaves partly thrice pinnately cut i.e., some primary lobes pinnate but others twice pinnately cut or leaves twice pinnately cut 33.
- 31. Plant with aerial, woody, strongly reduced, perennial, sterile shoots; inflorescence narrowly compact panicle with adpressed branches 141. **A. tenuisecta** Nevski.
- + Plant with weakly developed or almost undeveloped, perennial, woody shoots; panicle with obliquely upward-directed branches 32.
- 32. Inflorescence broadly paniculate, with rather long (up to 10–15 cm) lateral branches; capitula remote or approximate 126. **A. schrenkiana** Ldb.
- + Panicle narrowly pyramidal, with shorter lateral branches; capitula crowded on branches 117. **A. maritima** L. var. **boschniakiana** DC.
- 568 33(30). Inflorescence more or less wide pyramidal panicle with divergent branches 34.
- + Inflorescence mostly compact panicle with branches adpressed to stem axis or obliquely upright 59.
- 34. Stems mainly 50–60 cm high, sometimes even more 35.
- + Stems mainly 15–45 cm high 41.
- 35. Lower leaves twice or thrice pinnately cut, i.e., primary lobes partly twice or once pinnately cut; plants of Caucasus 36.
- + Lower leaves mainly twice pinnately cut; plants of Soviet Central Asia 37.
- 36. Lower leaves often up to 10 cm long, terminal lobe linear, 5–10 mm long, flat 119. **A. szowitziana** (Bess.) Grossh.
- + Lower leaves smaller, their lobes up to 3–5 mm long, linear-filiform 120. **A. fragrans** var. **phyllostachys** Boiss.
- 37. Lower leaves up to 1 cm long; capitula narrowly ovoid or narrowly oblong 159. **A. stenocephala** Krasch. ex Poljak.
- + Leaves larger; capitula ovoid 38.
- 38. Terminal lobes of lower leaves narrowly linear, usually up to 7–20 mm long and 0.3 mm wide 157. **A. kochiiformis** Krasch. and Lincz. ex Poljak.
- + Terminal lobes of lower leaves linear, shorter and wider 39.
- 39. Capitula spicately borne on secondary branches; lower leaves up to 3–5 cm long, terminal lobe small, up to 2–4 mm long 150. **A. serotina** Bge.
- + Capitula more or less remote or approximate, few in each inflorescence; lower leaves up to 4–8 cm long, terminal lobe longer 40.

40. Terminal lobe of lower leaves up to 1.5 mm wide, all or some with 2–3 teeth at apex 148. **A. ferganensis** Krasch. ex Poljak.
 + Terminal lobes of lower leaves 0.5–1.0 mm wide, acuminate, not toothed 149. **A. porrecta** Krasch. ex Poljak.
- 41(34). Lower leaves twice or thrice pinnately cut 42.
 + Lower leaves twice pinnately cut 46.
42. Capitula mainly (2.5)3.0–4.0 mm long; lower leaves 2–4 cm long; bracteal leaves usually exceeding capitula; plants with perennial, short, creeping, sterile shoots 43.
 + Capitula 2.0–2.5 mm long; lower leaves up to 1.5–2.0 cm long, upper bracteal leaves not exceeding capitula; plants with perennial, reduced, woody ascending shoots 44.
43. Capitula 3–4 mm long, with 7–10 florets; bracteal leaves usually exceeding capitula 117. **A. maritima** L.
 + Capitula 2.5 mm long, with 4–5 florets 117. **A. maritima** L. var. **palmata** L.
- 569 44. Inflorescence branches obliquely upward-spreading; stems slender, glabrescent, brown 154. **A. turanica** Krasch. var. **pallida** Poljak.
 + Branches almost horizontal; stems partly glabrescent, partly pubescence till end of vegetative period 45.
45. Stem up to 40 cm high, at base often up to 3 mm thick, pubescent almost to end of vegetative period; capitula more or less approximate on branches 154. **A. turanica** Krasch. var. **diffusa** (Krasch.) Poljak.
 + Stems low, up to 25 cm high, more slender, partly glabrescent, weakly branched; capitula fewer, remote on branches 154. **A. turanica** Krasch. var. **eremophila** Poljak.
- 46(41). Terminal lobes of leaves narrowly linear or almost filiform-linear; capitula broadly ovate, less often ovoid 47.
 + Terminal lobes linear or narrowly linear; capitula more or less ovate or narrowly ovate 48.
- 47(46). Capitula broadly ovate 120. **A. fragrans** Willd.
 + Capitula ovate 120. **A. fragrans** Willd. var. **gurganica** Krasch.
- 48(46). Lower leaves mainly 3–4 cm long or to 7 cm long 49.
 + Lower leaves up to 1–2–3 cm long 51.
49. Plants with numerous, ascending, woody, perennial shoots forming low tussocks; capitula in compact panicle, up to 3 mm long, upright 151. **A. valida** Krasch. ex Poljak.
 + Plants not forming tussock; capitula in spreading or lax, usually narrow panicle, somewhat approximate or partly remote, 3–4 mm long, erect or drooping 50.

50. Stems initially grayish, densely tomentose, later almost glabrous, brown, smooth; branches of inflorescence almost horizontal; capitula pedunculate, often drooping, in lax inflorescence 118. **A. monogyna** Waldst. and Kit.
- + Stems in part glabrescent, light brownish, inflorescence branches obliquely upright in lower part; capitula sessile, erect 123. **A. nitrosa** Web. ex Stechm.
- 51(48). Capitula small, usually 2–3 mm long 52.
- + Capitula larger, 3–4 mm long 54.
52. Low shrub, 12–15(30) cm high; terminal lobes of lower leaves 1–2 mm long, acuminate 138. **A. camelorum** Krasch.
- + Plant 30–45 cm high; terminal lobes longer 53.
53. Stems slender, green above, with short, more or less divergent branches; mature capitula divergent or drooping 137. **A. aralensis** Krasch.
- + Stems virgate, brown, with long, obliquely upright branches; capitula sessile, erect 153. **A. namanganica** Poljak. var. **uzbekistanica** Poljak.
- 570 54. Terminal lobes of lower leaves small, broadly linear; mature capitula mainly divergent or drooping 125. **A. halophila** Krasch.
- + Terminal lobes of lower leaves narrowly linear; Capitula mainly erect 55.
55. Terminal lobe of lower leaves usually up to 4–6 mm long.. 56.
56. Stems usually straight; leaf lobes narrowly linear; inflorescence branches mostly up to 4–7 cm long 160. **A. kopetdaghensis** Krasch. ex Poljak.
- + Stems partly flexuous; leaf lobes linear or oblong-linear, inflorescence branches longer 156. **A. scotina** Nevski
57. Perennial plant with woody, short, perennial, sterile shoots forming small tussocks; stems rather numerous; capitula with grayish, arachnoid-hairy involucre 153. **A. namanganica** Poljak.
- + Semishrubs with woody, erect or ascending, sterile shoots covered with grayish bark; capitula with bright glaucescent green, punctate-glandular involucre 58.
58. Inflorescence branches shorter; leaves grayish; upper bracteal leaves simple, not exceeding capitula; capitula 3–4 mm long 164. **A. prasina** Krasch. ex Poljak.
- + Inflorescence branches elongate; leaves grayish-green, upper bracteal leaves pinnate, some simple, exceeding capitula; capitula 2–3 mm long 163. **A. badhysi** (Krasch.) and Lincz. ex Poljak.
- 59(33). Lower leaves twice or thrice pinnately cut 60.

- + Lower leaves twice pinnately cut 69.
- 60. Plant up to 40–75 cm high, glabrous or subglabrous at end of vegetative growth; terminal lobes of lower leaves usually up to 4–8 mm long; capitula 3–5 mm long 61.
- + Plant usually 10–40 cm high, more or less hairy up to the end of vegetative growth; terminal lobes of lower leaves shorter, less often longer than 4 mm; capitula 2.0–3.5 mm long 65.
- 61. Mature capitula 3–5 mm long 62.
- + Capitula not more than 3 mm long 64.
- 62. Stems stramineous-brownish, with narrowly linear panicle; terminal lobes of lower leaves filiform-linear, 2–8 mm long 146. **A. ciniformis** Krasch. and M. Pop. ex Poljak.
- + Stems light brownish; panicle narrowly oblong, with obliquely upright branches; terminal lobes of lower leaves narrowly linear or linear, 1–5 mm long 63.
- 571 63. Lower leaves with oblong lamina; their terminal lobes 3–5 mm long, linear; plants with pleasant lemon fragrance 161. **A. balchanorum** Krasch.
- + Lower leaves with oval or roundish lamina, their terminal lobes 1–3 mm long, almost lobate; plant with camphor fragrance 162. **A. turcomanica** Gndg.
- 64. Terminal lobes of leaves linear; upper bracteal leaves usually exceeding capitula; capitula oblong-ovoid (2 mm in dia and up to 3 mm long) 147. **A. glanduligera** Krasch. ex Poljak.
- + Terminal lobes of leaves narrowly linear; upper bracteal leaves usually not exceeding capitula; capitula narrowly ovoid 141. **A. tenuisecta** Nevski var. **karataviense** Krasch. ex Poljak.
- 65(60). Small shrub, 10–25 cm high, with numerous, woody, strongly reduced, sterile stolons forming rather compact tussocks; stems numerous, initially arachnoid-hairy, later glabrous, dark brown or brownish; capitula narrow, 2.0–2.5 mm long, in compact condensed panicle 66.
- + Small shrub, 20–40 cm high, with loose, inconspicuous tussocks; stems fewer, by the end of vegetative growth partly glabrescent, arachnoid hairy; capitula ovoid or oblong-ovoid, 2.0–3.5 mm long, in comparatively lax panicle 67.
- 66. General color of plants dark greenish-brown from caducous pubescence; stems glabrous in second half of summer; dark brown; terminal lobes of leaves linear lanceolate; involucre bracts glabrous or subglabrous, yellowish, lustrous 133. **A. pauciflora** Web. ex Stechm.
- + General color of plants grayish from pubescence persisting up to the fall; stems usually hairy, stramineous-brownish; terminal lobes

- of leaves narrowly linear; involucre bracts whitish hairy and punctate-glandular 134. **A. gracilescens** Krasch. and Iljin
67. Capitula oblong-ovoid, 3.0–3.5 mm long; lower leaves 1.5–2.5 cm long, their terminal lobes filiform-linear 3–5(7) mm long 121. **A. taurica** Willd.
- + Capitula ovoid, 2–3 mm long; lower leaves 2–4 cm long, their terminal lobes narrowly linear, 2–3 mm long 68.
68. Middle cauline leaves always withering and usually falling by the second half of summer; plants of clayey alkali soils 122. **A. lercehana** Web. ex Stechm.
- + Middle cauline leaves persisting into summer and not withering; plants of desert-steppes 122. **A. lercehana** Web. ex Stechm. var. **astrachanica** Poljak.
- 572 69(59). Plants mostly 50–80 cm high; lower leaves usually not less than 4–8 cm long; terminal lobes 4–12 mm long 70.
- + Plants shorter, with smaller leaves 71.
70. Lower leaves 4–6 cm long, their terminal lobes 4–8 mm long, narrowly linear, 0.5–0.7 mm wide, with short stiff tip; capitula 3 mm long 140. **A. transiliensis** Poljak.
- + Lower leaves 5–8 cm long, their terminal lobes 7–12 mm long and 1 mm wide, scarcely acuminate; capitula up to 4 mm long 152. **A. gypsacea** Krasch., Pop. and Lincz. ex Poljak.
- 71(69). Capitula narrowly cylindrical, up to 4–5 mm long, with densely hairy and tuberculate-glandular involucre; stem slender, glabrous at the end of vegetative growth, dark brown 165. **A. spicigera** C. Koch.
- + Capitula ovoid; plant with characters otherwise 72.
72. Capitula 3–4 mm long; plant whitish from dense tomentum almost up to end of vegetative growth 73.
- + Capitula 2–3 mm; plants grayish-green or green, at the end of vegetative growth glabrous or relatively weakly hairy, less often plants densely hairy 75.
73. Lower leaves 2–4 cm long, their terminal lobes linear 3 mm long, subobtusely; flowers 6–8 120. **A. fragrans** Willd. var. **ericanica** Bess.
- + Lower leaves up to 2.5 cm long, their terminal lobes narrowly linear and acute or filiform-linear, 2–4 mm long; flowers 3–4 74.
74. Stems relatively slender, 25–40 cm high; panicle more or less dense, oblong 135. **A. terrae albae** Krasch. var. **heptapotamica** Poljak.
- + Stems thicker, 20–35 cm high; panicle narrow, condensed, almost linear, lax 135. **A. terrae albae** Krasch. var. **semiarida** Krasch. and Lavr.

- 75(72). Plant glaucescent green, with stramineous brownish smooth stems 145. **A. cina** Berg. ex Poljak.
 + Plants green or grayish-green, more or less hairy 76.
 76. Terminal lobes of leaves linear or oblong-linear 77.
 + Terminal lobes of lower leaves narrowly linear 78.
 77. Stems slender, 16–25(30) cm high; panicle very narrow with fewer capitula; terminal lobes of leaves linear or prolate-linear
 144. **A. fedtschenkoana** Krasch.
 + Stems sturdy, virgate, 25–45 cm high; panicle oblong, dense, with large number of capitula; terminal lobes of leaves linear
 151. **A. valida** Krasch. ex Poljak.
 78(75). Stems branched almost from base; capitula few, remote or more or less approximate in comparatively narrow, pyramidal panicle 144. **A. fedtschenkoana** Krasch. var. **issykkulense** Poljak.
 + Stems branched in upper part; capitula approximate in prolate panicle 79.
 79. Lower cauline leaves up to 3–4 cm long 80.
 573 + Lower cauline leaves 1.5–3.0 cm long 81.
 80. Terminal lobes of lower leaves 5–12 mm long; panicle oblong-linear; plant 30–45 cm high
 139. **A. sublessingiana** (Keller) Krasch. ex Poljak.
 + Terminal lobes of leaves much shorter; panicle narrow linear; plant 25–30 cm high
 139. **A. sublessingiana** Krasch. ex Poljak. var. **gorjavii** Poljak.
 81. Plants 12–20 cm high, grayish-green from dense hairs persisting till end of vegetative growth
 141. **A. tenuisecta** Nevski var. **mucronulata** Poljak.
 + Plants 30–40 cm high, weakly hairy in second half of summer, green 141. **A. tenuisecta** Nevski var. **glaucina** Poljak.

Section 1. Serphidium.—All leaves simple, entire or pinnately lobed or even partly, at apex, with 3–5 teeth.

Series 1. Maritimae Poljak.—Perennials, more or less densely hairy, with short, perennial, creeping or ascending nonflowering shoots, not or partly forming tussock; lower cauline leaves or leaves of vegetative shoots twice or thrice pinnately incised.

117. **A. maritima** L. Sp. pl. (1753) 846.—*A. maritima* Stechm. Dissert. Artemis. (1775) 17, pro parte. —*A. maritima linnaeana* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 33.—*A. maritima genuina* Ldb. Fl. Ross. II, 2 (1844–1846) 571, pro parte.—*A. maritima* L. ssp. *maritima* (L.) Hegi, Ill. Fl. II, 662.—*A. maritima* var. *genuina* Kryl.

Fl. Alt. III (1904), non. L.—*A. palmata* Lam. Encycl. meth. I (1789) 268; Bess. op. cit. 29.—*A. gallica* Willd. Sp. pl. III (1800) 1834.—*A. salina* Willd. ibid. 1884.—*A. maritima boschniakiana* Bess. op. cit. 39.—*A. boschniakiana* (Bess.) DC. Prodr. VI (1837) 104.

Whole plant whitish-woolly tomentose. Root vertical, woody, with short, perennial, creeping shoots. Fertile stems few, 20–40(50) cm high, ascending or erect, branched above, with long, partly short branches, most often not strongly divergent. Lower cauline leaves petiolate, 2–3(4) cm long, lamina oval, twice or thrice pinnatisect, their terminal lobes linear, somewhat flat, subacute or obtuse; middle cauline leaves short-petiolate or sessile, once pinnatisect or twice pinnately cut, uppermost leaves bracteal, often exceeding capitula, sessile, simple, linear, sometimes with 2 short lateral lobes at base. Capitula sessile, ovoid, usually 3–4 mm or 2.5 mm long, with 3 flowers (var. *palmata* Lam.), rather densely spicate on branches in somewhat appressed or more or less spreading paniculate inflorescence. Involucral bracts with scarious margin; outer bracts small, oval, densely hairy, inner bracts larger, oblong-lanceolate, glabrous or subglabrous, smooth. Florets (6)7–10.

Seacoasts.—*European part*: Baltic Region, Bessarabia, Black Sea Region; *Caucasus*: Transcaucasia. *General distribution*: Scandinavia, Atlantic Europe, Mediterranean Region (west, east), Balkans-Asia Minor. Described from Denmark. Type in London.

Note. The following varieties are distinguished:

- 1) Var. *palmata* Lam.—with small (up to 2.5 mm long), few-flowered capitula.
- 2) Var. *boschniakiana* Bess.—With bi- or tripinnatisect leaves having narrowly linear, almost filiform lobes.
- 3) Var. *salina* (Willd.) Koch.—With dense whitish pubescence and very strongly divergent branches.

118. **A. monogyna** Waldst. and Kit. Descr. et Icon. pl. rar. Hung. I (1802) 77, tab. 75; Poljak. in Majeovski, Fl. 584.—*A. santonica* Waldst. and Kit. k. c. p. XXX, non L. —*A. nutans* Willd. Sp. pl. III (1800) 1832.—*A. maritima* var. *wilhelmsiana* Bess. var. *blumiana* Bess. var. *O. kitaibelliana* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 32, 40.—*A. maritima* var. *monogyna* Ldb. Fl. Ross. II, 2 (1844–1846) 573.—*A. maritima salina* Kell. V Obl. Polupustyni (1907) 104–109.—*A. salina* ssp. *monogyna* Sagorski in Oest. Bot. Zeitschr. (1907) 16.—*A. salina* ssp. *monogyna* var. *kitaibelii* Sagorski in Mitt. Thür. Bot. Ver. Neue Folge, XXIII (1908) 82.—*A. santonicum* var. *monogyna* Fritsch. in Sched. ad. Fl. exs. Austro-Hung. No. 2265.—*A. maritima* var. *monogyna* Fedtsch. in Perech. Rast. Turk. IV (1911) 194, non

Waldst. and Kit.—*A. maritima* ssp. *monogyna* (Waldst. and Kit.) Hegi, Ill. Fl. II, 2 (1929) 664.—*A. salina* Kell. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI (1930) 354, non Willd. (pro parte).—*A. stepposa* Kell. and Kom. Ibid. 355 (pro parte).—*A. maritima salina* Kell. f. *citriodora* Kazakevich., nom.—*A. kobstanica* Rzazade and *A. paucifloriformis* Rzazade in Izv. Akad. Nauk Azerb. SSR, 3 (1955) 25.—**Exs.:** Fl. Hung. No. 585.

Perennial. Plant grayish, densely arachnoid-hairy, later weakly hairy or subglabrous. Root relatively slender, woody, vertical, with short, ascending, perennial, woody shoots, not forming tussocks. Fertile shoots more often 12–20, sometimes even more, less often few, erect or weakly flexuous, slender, stiff, 30–40(50) cm high, branched above, with obliquely upward-spreading, sometimes drooping branches. Leaves of vegetative shoots and lower cauline leaves, long-petiolate, 2–4(5) cm long, lamina oblong-ovate or oblong, twice pinnately cut, their terminal lobes narrowly linear, subacute; middle cauline leaves sessile, uppermost bracteal, simple, linear. Capitula usually pedunculate, narrowly 575 campanulate, with mature, 3–4 mm long, approximate or somewhat remote, often drooping, in more or less spreading paniculate inflorescence. Involucral bracts with wide scarious margin; outer bracts oval, pubescent dorsally, inner bracts larger, oblong, in upper part weakly hairy or glabrous, smooth. Flowers 3–4, usually purple red.

River terraces, ravines, depressions, salt marshes and alkali soils, sometimes on outcrops of calcareous rocks.—*European part:* Black Sea Region, Bessarabia, Crimea, Lower Don, Trans-Volga, Lower Volga. *General Distribution:* Central Europe. Described from Hungary. Type in Vienna.

Note. The form *citriodora* Kazak., found on the left bank of the Volga River, is distinguished by a rather strong lemon fragrance. Morphologically, it is closest to *A. monogyna* Waldst. and Kit. According to the data of Spiridonov, the yield of essential oil from f. *citriodora* is as high as 0.4%, and the oil contains pinene, about 8% camphors, about 19% borneole and cadinene (?), 34%—citral and 2% phenols.

119. **A. szowitziana** (Bess.) Grossh. Fl. Kavk. IV (1934) 142; Oprod. Rast. Kavk. 465.—*A. maritima* var. *szowitziana* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 34; Ldb. Fl. ross. II, 2, 574.—*A. maritima* var. *hanseniana* Bess. op. cit. 44.—*A. hanseniana* Grossh. Fl. Kavk. IV (1934) 143 p. p.—*A. prilipkoana* Rzazade and *A. nachitschevanica* Rzazade (p. p.) and *A. iskenderiana* Rzazade p. p. in Izv. Akad. Nauk Azerb. SSR, 3 (1955) 26–28.

Perennial. Plant grayish, densely arachnoid hairy, later weakly pubescent, partly glabrous. Root woody, with short nonflowering shoots bearing rosettes of leaves in upper part. Fertile stems few, straight, strong, 60–100 cm high, branched above with long, sulcate, strongly divergent, sometimes almost horizontal branches. Lower cauline leaves and leaves of vegetative shoots deciduous, up to 10 cm long and 4 cm wide, long-petiolate, with pinnately cut auricles; lamina twice or thrice pinnately cut, lobes remote, terminal lobes flat, linear, 5–10 mm long and 1 mm wide, subacute; middle and upper cauline leaves shorter, sessile or short-petiolate, less divided; bracteal leaves simple, linear, 2–4(5) mm long. Inflorescence broadly paniculate; capitula ovoid, pedunculate, drooping, 3.5–4.0 mm long and 2 mm in dia, more or less remote. Involucral bracts hairy, with scarious margin; outer bracts oblong-oval, inner larger, elliptical. Flowers 4–5. Flowering August to September.

Ravines, coastal regions, often as weed in irrigated fields.—*Caucasus*: Eastern Transcaucasia. Endemic. Described from the Caucasian coast of the Caspian Sea (near Salyan). Type in Leningrad.

Economic Importance. According to A.A. Grossheim (1947), the plant contains about 0.5–0.6% essential oil. According to I.A. Damirov (1949), the oil contains 1.4–3.2% santonin.

- 576 **Note.** According to Besser, *A. maritima* f. *hanseniana* Bess. has oblong-linear leaf lobes but the lower capitula are drooping, which indicates its definite proximity to *A. szowitziana* Bess. and *A. monogyna* Waldst. and Kit. but in no way to *A. fragrans* Willd., as was believed by Grossheim.

120. *A. fragrans* Willd. Sp. pl. III (1804) 1835; DC. Prodr. VI, 104, excl. syn.; Grossh. Opred. Rast. Kavk. 465.—*A. fragrans* Willd. β . *phyllostachys* Boiss. Fl. or. III (1875) 366.—*A. fragrans* Willd. ssp. *gurganica* Krasch. in Otch. o Rab. Pochv.-bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 245.—*A. phyllostachys* (Boiss.) Woron. in Sched. ad Herb. Fl. cauc. X, VI (1931) No. 498.—*A. maritima* var. *erivanica* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 44; Ldb. Fl. Ross. II, 574.—*A. taurica* var. *erivanica* DC. op. cit. 104.—*A. taurica* var. *hanseniana* DC. op. cit. 104.—*A. maritima* var. v. *meyeriana* Bess. op. cit. 39.—*A. maritima* var. *fragrans* Ldb. op. cit. 570.—*A. maritima* var. *persica* f. *hanseniana* Ldb. op. cit. 574.—*A. hanseniana* Grossh. Fl. Kavk. IV (1934) 146.—*A. hanseniana* var. *phyllostachys* (Boiss.) Grossh. and var. *divaricata* Grossh. op. cit. 146.—*A. meyeriana* Grossh. Opred. Rast. Kavk. (1949) 465.—*A. meyeriana* Grossh. var. *divaricata* Grossh. op. cit. 465.—*A. erivanica* Grossh. op. cit. 143.—*A. fedorovi* Rzazade and *A. iskenderiana* Rzazade p. p. and *A. divaricata* (Grossh.)

Rzazade and *A. nachitschevanica* Rzazade p. p. in Izv. Akad. Nauk Azerb. SSR, 3 (1955) 24, 27.

Perennial. Plant 25–30–45 cm high, whitish-tomentose at beginning of vegetative growth, later partly glabrous. Root vertical, woody, about 0.5–1.0 cm thick. Fertile stems few or more or less numerous, erect, branched from slightly above middle, with divergent branches. Lower cauline leaves petiolate, 2.5–3.5 cm long, oblong, twice pinnately cut, terminal lobes 2–5 mm long, thickish, narrowly linear or filiform-linear obtuse; middle cauline leaves sessile, simple pinnate, with pinnately cut auricles; bracteal leaves simple, linear, 2–4 mm long. Capitula sessile, broadly ovoid or subglobose, 3.0–4.5 mm long and 2–3 mm (var. *gurganica* (Krasch.) P. Pol.), erect or divergent, in oblong, pyramidal, panicle inflorescence. Outer involucre bracts short, oval, convex, inner bracts larger, oblong-linear, with wide scarious margin, greenish dorsally. Florets yellow, 3–6, anthers with short filaments, linear, apical appendages of anthers narrowly linear, almost cuneate, basal appendages much smaller, somewhat subobtusate; style included; stigma lobes short-linear, erect, truncate, ciliate apically along margin, divergent after flowering, slightly exserted from corolla. Flowering August.

Foothill plains as well as clayey slopes of foot-hills.—*Caucasus*: Eastern and Southern Transcaucasia, Dagestan; *Soviet Central Asia*: Aralo-Caspian Region. *General distribution*: Armenia and Kurdistan, Iran. Described from Armenia. Type in Berlin.

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Note 1. *A. fragrans* Willd. is very close to *A. taurica* Willd. The latter species is not found in Azerbaidzhan. The epithet "*A. hanseniana*," used by Grossheim in the "Flora Kavkaza" [Flora of the Caucasus], actually replaced Willdenow's *A. fragrans*, which is completely illegitimate because Besser's form "*A. maritima hanseniana*" can be compared only with *A. szowitziana* Willd. and not in any way with *A. fragrans* Willd. Thus, I do not find any basis for splitting *A. fragrans* Willd. into two or even three species, as was proposed by Grossheim. The history of *A. divaricata* (Grossh.) Rzazade is as follows. First, Grossheim segregated a form that seemingly conformed to *A. maritima* var. *meyeriana* Bess. (differing, according to Besser, by "a slightly divergent panicle and hyaline inner involucre bracts,") and elevated it to the rank of a separate new species—*A. meyeriana* Grossh. At the same time, the author did not provide a description, nor did he indicate the type specimen, but only mentioned that his new species is distinguished from *A. fragrans* Willd. by the absence of grooves on the dorsal side of the leaves. Later, in the "*Opradelitel' Rastenii Kavkaza*" [Manual of Plants of Caucasus] A.A. Grossheim split off from *A. meyeriana* Grossh. one more variety—var.

divaricata Grossh., which is distinguished by spreading, often flexuous branches. Rzazade elevated Grossheim's variety to the rank of species without mentioning the type and without giving a description.

Note 2. The following varieties are distinguished:

1) Var. *erivanica* Bess.—distinguished by a comparatively narrow and compact panicle, with obliquely upward directed, slightly elongate branches, linear lobes of the leaves, and ovoid capitula; found in Southern and Eastern Transcaucasia;

2) Var. *phyllostachys* Boiss.—With long (up to 20 cm), angular, strongly divergent, sparse branches and ovoid capitula; found in Southern and Eastern Transcaucasia.

3) Var. *gurganica* Krasch.—With not so strongly divergent and elongate branches and ovoid capitula; south-western Turkmenia.

Economic Importance. According to Karakash and Zelentsova (1938), the fresh and the dry herb of *A. fragrans* contains 0.87–0.92% essential oil. Traces of alkaloids have also been reported (Mirzoyan and Amirzadyan, 1949). In the opinion of Magakyan and others, it is one of the main fodder plants in Armenia and the Nakhichevan ASSR in the fall. At this time of the year, it is relished by sheep and less so by donkeys and horses. It is also eaten in the spring but less than ephemerals and ephemeroïds. It is not eaten by big horn cattle; in some regions (Magakyan, 1953) it is mowed for hay. There are reports about the prophylactic (anthelmintic) action of this wormwood on sheep (Magakyan, 1953). According to I.A. Damirov (1949), the essential oil contains 1.5–2.9% santonin.

According to Grossheim (1946), the plant contains 0.3–0.19% essential oil; its main constituents are cineole, thujone and others.
578 Moreover, the plant contains 5–12% tannin (depending upon the stage of development); the leaves collected in May contain 14.5 mg% of vitamin C, while those collected in the fall contain 11.4 mg%.

121. *A. taurica* Willd. Sp. pl. III (1800) 1837; MB. Fl. taur.-cauc. II (1808) 291.—*A. maritima* var. *v. taurica* Ldb. Fl. Ross. II, 2 (1846) 574.

Perennial. Plant whitish or gray from dense arachnoid hairs persisting to a considerable extent to the end of vegetative growth. Root vertical, woody, thick, with strongly reduced, sterile shoots and rather numerous straight, stiff, sulcate, stems 15–35–40 cm high, branched above with short or slightly elongated, obliquely upward directed branches. Leaves of sterile shoots and lower cauline leaves petiolate, 1.5–2.5 cm long, lamina oval-oblong, twice or almost thrice pinnately cut, their terminal lobes linear-filiform, 3–5 mm long, acuminate or subobtusate; upper cauline leaves sessile, less divided;

bracteal leaves simple, linear-filiform, 3–5(6) mm long. Capitula sessile, ovoid, 3.0–3.5 mm long and about 2 mm in dia, upright, rather densely spicate on branches in more or less narrowly paniculate inflorescence. Involucre imbricate, densely covered with gray hairs; involucre bracts convex, with scarious margin, outer bracts oval, inner larger, oblanceolate or lanceolate. Florets 6–8. Achenes up to 1 mm long, ovate, somewhat flat, grayish, finely sulcate. Flowering August.

Clayey alkali soils, and also as ruderal and weed.—*European Part*: Crimea; *Caucasus*: Ciscaucasia. Endemic. Described from Crimea. Type in Berlin.

Economic Importance. The essential oil of *A. taurica* Willd., as reported by N.A. Lvov, consists of obeintole ($C_{10}H_{16}O$) and terpene ($C_{10}H_{16}$), and possesses poisonous properties. Moreover, this plant also contains lactone tauricine ($C_{14}H_{14}O_3$) which is related to santonin. The oil of *A. taurica* Willd. causes strong irritation, spasms, and deafness in animals. Tauricine has the same properties, but in addition it affects the autonomic nervous system. Tauric wormwood is poisonous to cattle and particularly to horses.

According to the data of Troitsky, in the pastures of Crimea it is relished by sheep in the fall-winter period as well as in the early spring when the young shoots have not yet acquired a bitter taste. According to Larin, these shoots, as shown by analysis, contain (in %): protein up to 27.1, fat 4.8, nitrogen-free extract 35.2, and only 12.4 cellulose. In the opinion of Larin, poisoning from hay of this species is not observed particularly frequently and not everywhere. However, he advises great caution while feeding animals with hay containing a large proportion of this wormwood.

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122. **A. lerceana** Web. ex Stechm. Dissert. *Artemisia* (1775) XXIV, XXV, excl. f. Gmel. Fl. Sib. II (1775) 114; Willd. Sp. pl. III, 3, 1838; Grossh. Opred. Rast. Kavk. 465; Poljak. in Majeovski, Fl. 585; in Tr. Inst. Khim. Akad. Nauk. Kaz. SSR. IV, 94.—*A. maritima* var. *lercheana* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 37; Ldb. Fl. Ross. II, 572; Fedtsch. Perech. Rast. Turk. IV, 193.—*A. maritima* var. *rossica* Bess. op. cit. 38, pro parte.—*A. humilis* MB. Besch. Casp. (1801) 83, 210.—*A. maritima* var. *lercheana* Ldb. Fl. Ross. II, 2 (1844–1846) 572, pro parte.—*A. maritima* var. *incana* Kell. V Obl. Polupustyni, II (1907) 110, non Druce.—*A. maritima* Bess. ssp. *incana* (Kell.) Krasch. in Otch. o Rab. Pochv.-Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 268, pro parte.—*A. maritima astrachanica* Kazak. (nomen) in Zhurn. Opytn. Agronom. Yugo-Vost. IV, II (1927).—*A. caspica* Kell. in Fl. Yugo-Vost. Evrop. Ch. SSSR VI (1936) 356, pro parte.—

A. astrachanica Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 422.

Perennial. Whole plant grayish from dense, arachnoid hairs, later partly glabrous. Root woody, with perennial, woody, strongly reduced and short, annual, vegetative, leafy shoots forming comparatively small tussocks. Flowering stems rather numerous or few, erect or ascending at base, 18–35(40) cm high, branched in upper half, with obliquely upright branches. Leaves of vegetative shoots and lower cauline leaves petiolate, 2–4 cm long, lamina oval-oblong, twice or thrice pinnately cut; their terminal lobes narrowly linear, usually 2–3 mm long; middle cauline leaves withering in summer, sessile or short-petiolate, twice pinnately cut, with pinnately cut auricles; uppermost leaves bracteal, simple, linear. Capitula sessile or on short peduncles, ovate; mature capitula narrow-goblet shaped, 2.0–2.5(3.0) mm long, usually not drooping, remote or few, spicately crowded on terminal branches in more or less compact paniculate inflorescence. Outer involucre bracts small, oval, densely arachnoid-hairy, inner bracts larger, oblong, with wide scarious border, apically hairy, elsewhere glabrous. Flowers 4–5; corolla yellow or pinkish. Flowering August to September.

Clayey alkali soils.—*European part*: Lower Don, Lower Volga; *Western Siberia*: Upper Tobol, Orenburg Region; *Soviet Central Asia*: Aralo-Caspian Region. Endemic. Described from Stalingrad District. Type in Berlin.

Note. One should recognize var. *astrachanica* Poljak., with leaves persisting in summer; it is a plant of desert-steppe sands, found in the northern Caspian Region, Turgai, and western Kazakhstan.

According to the data of A.A. Rikhter, L.I. Kazakevich, O.I. Sobolevskaya, and K.T. Suverova, the essential oil of var. *astrachanica* Poljak. contains up to 90.8% camphor. According to M.I. Goryaev and N.I. Bakanina, the oil contains cineole, camphor, thujone, borneole and phenol. According to the data of R.N. Sazonova, it contains up to 580 0.2% santonin. In the opinion of Aleksandrovsky and Beguchev (1931), the nutritive value of var. *astrachanica* is not high; it is relished more by sheep and camels in the fall.

In the opinion of Larin (1956), this wormwood is a valuable fodder plant in the semidesert fall-winter pastures.

123. *A. nitrosa* Web. ex Stechm. Dissert. Artemisia (1775) 24; Bess. in Bull. Soc. Nat. Mosc. VII, 45; Ldb. Fl. Ross. II, 2, 576; Kryl. Fl. Zap. Sib. XI, 2781, 2782.—*A. maritima* var. *λ. gmeliniana* Bess. op. cit. 38; Fedtsch. Perech. Rast. Turk. IV, 94; DC. Prodr. VI, 104.—*A. maritima* var. *lercheana* f. *gmeliniana* Ldb. Fl. Ross. II, 2 (1846)

573, quoad pl. Gmel.—*A. maritima* var. *σ. genuina* f. tt. *suberecta* Ldb. Fl. ross. II, 2 (1846) 572, pro parte quoad pl. sib.—*A. maritima* Bess. var. *η. lercehana* f. *dahurica* Turcz. Fl. baic.-dahur. III (1856) 56.—*A. maritima* var. *genuina* Kryl. Fl. Alt. III (1904) 639.—*A. maritima* Bess. ssp. *incana* (Kell.) Krasch. in Otc. Rab. Pochv.-Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 268.—*A. maritima* ssp. *gmeliniana* (Bess.) Krasch. in Spisok Rast. Gerb. SSSR, X (1936) 99.—*A. mongolorum* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, ser. 1, No. 3 (1936) 350; Krascheninn. op. cit. 2782 incl. ssp. *gobica* Krasch.—*A. schischkint* Krasch. in Sistem. Zam. Gerb. Tomsk. Univ., 1–2 (1940) 2; Kryl. Fl. Zap. Sib. XI, 2786.—*A. lercehana* auct. non Web.: Ldb. Fl. Alt. (1934) 84 quoad pl. Tschujens.—*A. lercehana* var. *humilis* DC. Prodr. VI (1837) 104, excl. syn. — *A. maritima* "s" *lercheana humilis* Ldb. Fl. Ross. II, 2 (1844–1846) 572, quoad plant. Tschujens. Kryl. Fl. Alt. III (1904) 639.—Exs.: GRF No. 3191a, b, c (sub *A. maritima*).

Perennial. Whole plant grayish-green from dense arachnoid-tomentose hairs, sometimes hairs partly persistent up to end of vegetative growth or subglabrous (var. *subglabra* Krasch.). Root relatively slender, with few (2–5) short, leafy in upper part, nonflowering annual shoots. Flowering stems erect, strong, up to 40(50) cm high, less often 5–12 cm (var. *gobica* Krasch.), branched in upper half, with somewhat divergent branches. Lower leaves long-petiolate, 3–7 cm long, lamina oval-lanceolate, twice pinnately cut, their terminal lobes narrowly linear, usually 3–5 mm long, subobtusate or short-acuminate; uppermost leaves undivided, sessile, linear. Capitula sessile, oblong or ovate, 3–4 mm long and 1.5–2.5 mm in dia, remote or crowded in groups of few on lateral branches in elongate, more or less oblong, paniculate inflorescence. Involucral bracts more or less densely hairy, later subglabrous, with scarious margin, outer bracts small, oval, inner bracts larger, oblong-lanceolate. Flowers 3–5; corolla purple-pink or yellow; anthers linear, apical appendages of anthers acute, basal appendages small, subacute, stigma lobes linear, truncate, ciliate. Flowering August to September.

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River valleys, margins of steppe lakes, ravines as well as in alkaline meadows, salt marshes and alkaline soils.—*Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Angara-Sayans, Dauria; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region (north). *General distribution*: Dzhungaria-Kashgaria, Mongolia. Described from Siberia. Type in Berlin.

Note. var. *gobica* Krasch. should be recognized. It is characterized by stems that are short (5–15 cm high), grayish-tomentose pubescence on the leaves that persists to the end of vegetative growth, small

(up to 1.5 cm long) lower leaves that are usually pinnatisect or bipinnatisect, and capitula that are racemosely or spicately borne. As regards *A. schischkini*, it corresponds to this variety.

Economic Importance. According to the data of M.I. Goryaev, A.T. Petushkova, and N.A. Sviridova, samples of *A. nitrosum* contain 0.1–0.5% alkaloids.

124. *A. scopaeformis* Ldb. Fl. Ross. II, 2 (1844–1846) 575; Fedtsch. Perech. Rast. Turk. IV, 195.

Perennial. Plant (18)25–45 cm high, grayish, arachnoid-tomentose, hairs sometimes partly shed at end of vegetative growth. Root rather thick, woody, verticle, with perennial, woody, strongly reduced, creeping or ascending nonflowering shoots forming a comparatively compact tussock. Flowering stems erect or ascending, more or less numerous, virgate, branched, with obliquely upright, less often drooping, 2.5 cm long or longer branches (f. *longiramosa* Poljak.). Leaves of nonflowering shoots and lower cauline leaves petiolate, (1)2–4 cm long, at base with simple, lanceolate or pinnate-lobate auricles, oblong-oval or oblong, simple pinnately cut; lobes more or less deeply divided into 2–4 lanceolate lobules with short-pointed tips or entire, middle cauline leaves sessile, pinnate; upper leaves undivided, linear. Capitula on short peduncles, ovoid, upright, 3–4 mm long, in narrow pyramidal paniculate inflorescence. Outer involucral bracts small, oval, weakly hairy, inner bracts larger, oblong-oval, dorsally brownish, subglabrous, with wide scarious margin. Flowers 3–4; corolla yellow or red.

Ravines, lake and dry depressions, ancient river terraces, meadow and takyrlike saline, crusty solonetz soils, sometimes on outcrops of varicolored clays.—*Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Irtysh. Endemic. Described from Chu River (Myun-Kumy). Type in Leningrad.

125. *A. halophila* Krasch. in Otch. o Rab. Pochv.-Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 272.

Perennial. Plant 20–40 cm high, white-tomentose. Root woody, up to 3–6 mm thick, less often thicker, vertical, with perennial, woody, 582 short, ascending, nonflowering shoots forming small tussocks; annual, very short shoots bear rosettes of leaves of summer vegetation. Flowering stems few or more or less numerous, often branching in lower half, with distinctly divergent lateral branches. Leaves thick; leaves of nonflowering shoots and lower cauline leaves long-petiolate, 1–3–4 cm long, lamina oblong or linear, twice pinnately cut; lobes divided into 2–4 short, broadly linear, acute lobes; middle and upper leaves sessile, once or twice pinnately divided; uppermost leaves small,

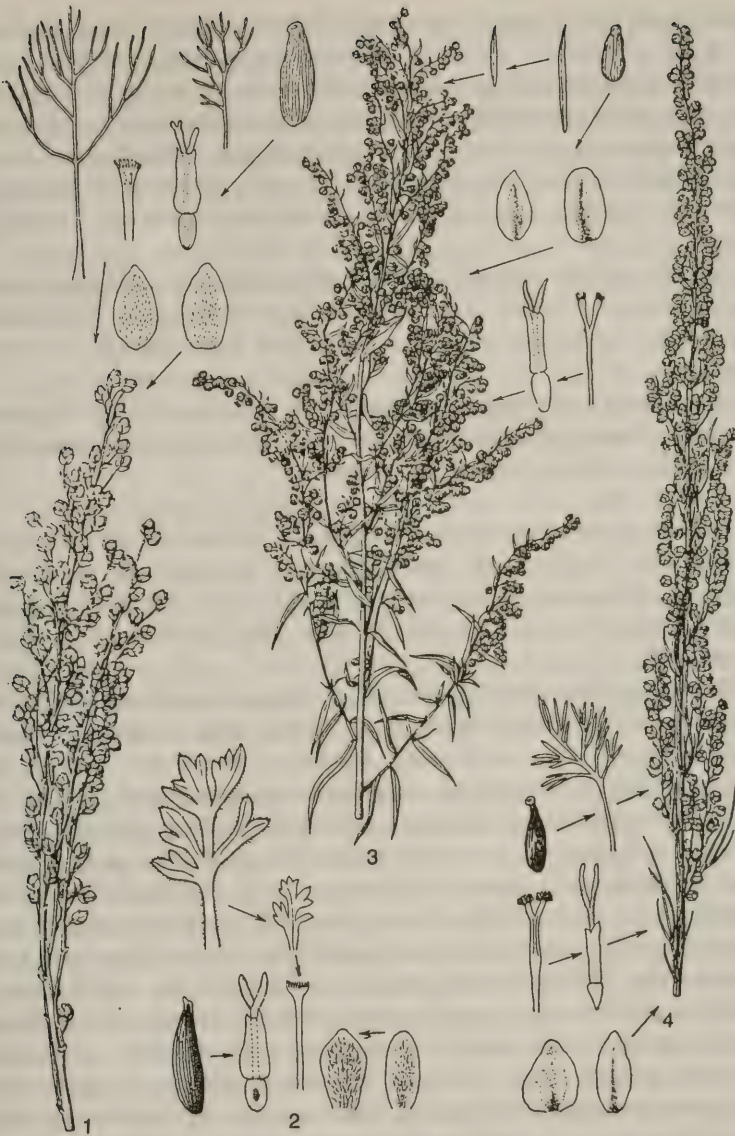


Plate XXVIII.

1 — *A. halodendron* Bess., upper part of stem; lower leaf, middle cauline leaf, abortive pistil of disk floret, peripheral pistillate floret, outer and inner involucre bracts; 2 — *A. pannosa* Krasch., lower leaf, cauline leaf, achene, peripheral pistillate floret, abortive pistil of disk floret, outer and inner involucre bracts; 3 — *A. glauca* Pall., upper part of plant, leaf, achene, outer and inner involucre bracts, peripheral pistillate floret, abortive pistil of disk floret; 4 — *A. commutata* Bess., upper part of plant, achene, lower cauline leaf, abortive pistil of disk floret, peripheral pistillate floret, outer and inner involucre bracts.

sessile, undivided, linear or even with 2 lateral lobes at base. Capitula on short peduncles, ovate or oblong-cup-shaped, 3–4 mm long, mature capitula drooping, remote or approximate at tips of branches, 2–3, in oblong-pyramidal panicle. Involucre many-rowed, imbricate; outer involucre bracts, small, oval, greenish-gray, densely hairy, inner bracts larger, oblong or oblong-oval, dorsally greenish or brownish with wide, lustrous, scarious margin. Florets more often red. Flowering August.

Highly saline soils of desert regions, outcrops of gypsiferous clays.—*Soviet Central Asia*: Aralo-Caspian Region, Kzyl-Kum, Kara-Kum, Syr-Darya. Endemic. Described from Ust-Urt. Type in Leningrad.

Economic Importance. According to the data of M.I. Goryaev, the yield of essential oil in this species is 0.82% of air-dry matter. The oil contains a large quantity of camphor.

126. *A. schrenkiana* Ldb. Fl. Ross. II, 2 (1844–1846) 575; Kryl. Fl. Zap. Sib. XI, 2783.—*A. albid*a auct. non Spreng. Ldb. Fl. Alt. IV (1834) 85, pro parte.—*A. maritima* Ldb. Fl. Alt. IV (1833) 85, non L.; Fedtsch. Perech. Rast. Turk. IV, 193 p. p.— *Ic.*: Ldb. Ic. pl. Fl. Ross. V, tab. 478.

585 Perennial. Plant whitish throughout vegetative period from dense arachnoid-woolly hairs. Root thick, with rather numerous, short, nonflowering shoots, partly leafy. Flowering stems few, straight, at base ascending, 30–50(60) cm high, branched above, with rather long (to 10–15 cm), divergent branches. Lower leaves long-petiolate, 5–10 cm long, others sessile, with semiamplexicaul¹, pinnately cut auricles at base; lamina broadly linear, 3–6 cm long, twice, or more often thrice pinnately cut, lobes widely spaced, terminal lobes narrowly linear, often enlarged above, spatulate and subobtusate, 2–6 mm long and 1.0–1.5 mm wide. Capitula oblong-ovoid, 2.5–3.0 mm long, usually erect, sessile or on short peduncles, remote or more densely crowded on lateral branches into broadly paniculate inflorescence. Involucre imbricate, grayish-hairy; involucre bracts with scarious margin, outer small, oblong-oval, inner longer, oblanceolate. Receptacle convex, conical. Flowers 5–6; corolla yellow; anthers linear, apical appendages of anthers narrowly linear, basal appendages shorter, subacute; style shorter than stamens; stigma lobes short, ciliate, divergent. Flowering August.

Steppe and desert-steppe regions, along river terraces, lake depressions, ravines, meadow and puffy salt marshes or highly alkaline soils.—*Soviet Central Asia*: Lake Balkhash Region, Irtysh, Altai, Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Northwest-

ern Mongolia, Dzhungaria-Kashgaria. Described from the Sary-Su River. Type in Leningrad.

According to the data of M.I. Goryaev (1952), the yield of essential oil from *A. schrenkiana* Ldb. is 0.29%. Based on analyses, the oil consists of the following constituents: organic acids—9%; phenols—8.7%; camphors—10.25%; aldehydes—2.75%; cineole—63.5%.

According to the data of M.I. Goryaev, A.T. Petushkova, and N.A. Sviridova, plant samples of this species contain 0.1–0.5% alkaloids.

Series 2. Compactae Poljak.—Capitula few or several on branches in rather compact spikes or racemes forming spicate or racemose paniculate inflorescence. Mainly alpine or montane plants.

127. **A. compacta** Fisch. ex DC. Prodr. VI (1837) 102; Kryl. Fl. Zap. Sib. XI, 2784.—*A. albida* Ldb. Fl. Alt. IV (1833) 85, pro parte.—*A. maritima* ϵ . *fischeriana* δ . *stephaniana*, i. *helmiana* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 34, 36.—*A. maritima* ϵ . *compacta* Ldb. Fl. Ross. II, 2 (1844–1846) 572; Kryl. Fl. Alt. III, 639; Fedtsch. Perech Rast. Turk. IV, 193.—*A. tianschanica* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 416; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR. IV (1959) 19, 20, 27, 28.

Perennial. Plant grayish-tomentose till end of vegetative growth. Root slender, woody, with numerous, short, woody, perennial, nonflowering shoots forming small, more or less compact tussocks. 586 Flowering stems few or more or less numerous, relatively slender, erect or partly ascending, 15–40 cm high, branched above, with obliquely upright branches. Basal and lower cauline leaves short-petiolate, 2–3 cm long, twice- or thrice-pinnately cut, their terminal lobes linear, subobtusely; middle cauline leaves less compound; uppermost leaves sessile, undivided, linear, often exceeding inflorescence. Capitula ovoid, 3–4 mm long and 2.0–2.5 mm in dia, sessile, crowded on branches in more or less compact, short spikes, remote or approximate and forming narrowly spicate-paniculate inflorescence. Outer involucre bracts oval, acuminate, hairy, inner bracts elliptical-lanceolate, subobtusely, glabrous, with scarious margin. Florets 3–4; corolla usually purple-pink, less often yellow; anthers linear, apical appendages of anthers acute, basal appendages shorter, short-acuminate; style shorter than stamens; stigma lobes linear, truncate, ciliate. Flowering August.

Clayey or rubbly-clayey slopes from foothill plains to high mountains.—*Western Siberia*: Altai, Irtysh; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region. *General distribution*: Dzhungaria-Kashgaria. Described from the Chuya River in Altai. Type in Leningrad.

According to the data of M.I. Goryaev, A.T. Petushkova, and N.A. Sviridova, about 0.1–0.5% alkaloids was found in plants of *A. compacta* Fisch.; these figures were confirmed by M.I. Goryaev (1959). According to the data of M.I. Goryaev, I.M. Shibanova, and L.A. Ignatova (1953), the essential oil contains: cineole—42%, carbonyl compounds—21.8%; the latter include 16.8% camphors and 5.62% aldehydes.

The aldehyde mixture presumably contains phellandral and perillaldehyde; in the higher fractions, apart from these, also present are azulene-forming sesquiterpenes imparting a blue color, but their content in the oil is very insignificant.

128. ***A. rhodantha*** Rupr. in Mém. Acad. Sc. Pétersb. VII, XIV, 4 (1869) 52; Fedtsch. Perech. Rast. Turk. IV, 195.

Perennial. Whole plant whitish-tomentose till end of vegetative growth, 6–15(20) cm high. Tap root thick, with underground or aerial, strongly reduced, upright, perennial woody shoots, rather closely approximate and also with still shorter, annual, nonflowering shoots forming compact tussocks. Flowering stems rather numerous or few, 4–15 cm high, sulcate, simple. Leaves of nonflowering shoots and lower cauline leaves petiolate, 1.0–2.5(3.0) cm long, petiole 0.5–1.5 cm long, lamina roundish or oval, twice, or almost thrice pinnately cut, lobes palmate-pinnate, terminal lobes linear, 2–3 mm long, subacuminate; cauline leaves short-petiolate or sessile, twice pinnate, at base with pinnately or palmately cut auricles; upper bracteal leaves 587 pinnate or in part simple, broadly linear, exceeding or as long as capitula. Capitula sessile, ovoid, 3 mm long, in groups of few borne in compact, oval, lax spikes, on very short peduncles or sessile, adpressed to stem in simple racemose or capitate-spicate inflorescence. Outer involucral bracts oblong-lanceolate, tomentose, inner bracts narrowly lanceolate, dorsally hairy, with scarious margin. Florets 5–7; corolla pink; anthers linear, apical appendages of anthers subulate, basal appendages shorter, short-acuminate; style shorter than stamens; stigma lobes linear, truncate, short-ciliate. Flowering August.

Alpine zone of mountains, on clayey and rubbly slopes.—*Soviet Central Asia*: Tien Shan, Pamiro-Alai Region. Endemic. Described from Lake Chatyrkul. Type in Leningrad.

Note. Until recently it was thought that *A. rhodantha* Rupr. is found only in the inner Tien Shan. However, our expedition to the eastern Pamirs in 1954 showed that this species is very widespread there too, but the local botanists usually regard it as *A. skorniakowii*.

129. *A. proluxa* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 401.

Perennial. Tap root woody, with perennial, woody, short, almost straight, ascending, nonflowering shoots covered with grayish-brown bark. Flowering shoots few or more or less numerous, 50–60 cm high, erect, white-tomentose, branched above, with long (up to 25–30 cm), straight, obliquely upright branches. Leaves densely arachnoid-hairy; lower cauline leaves withering before flowering, long-petiolate, 4–5 mm long, lamina oblong-oval, twice pinnately cut, terminal lobes narrowly linear, 5–8(10) mm long, short-acuminate; middle cauline leaves smaller, short-petiolate or sessile, with pinnate auricles at base; upper leaves sessile, undivided, linear, sometimes with 2 lateral lobes at base. Capitula sessile, ovate, 3 mm long, usually in groups of few in approximate or remote heads on very short terminal branches in long (up to 30 cm) pyramidal-paniculate inflorescence. Involucral bracts with wide scarious margin; outer bracts smaller, oval, densely covered with white hairs; inner larger, oblong, glabrous, smooth. Florets 5–6; corolla yellow.

Clayey slopes of lower mountains.—*Soviet Central Asia*: Syr-Darya, Pamiro-Alai Region, Tien Shan. Endemic. Described from Fergana, from hills near the village of Dragomirovo. Type in Leningrad.

130. *A. dubjanskyana* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 397.

Perennial. Whole plant whitish from arachnoid tomentum; root vertical, woody, 5–8 mm thick, with short, perennial, woody, nonflowering shoots, together with annual, leafy nonflowering shoots forming small tussocks. Flowering shoots few, 20–30 cm high, slender, erect, weakly branched above, with very short (1.0 to 2.5 cm long), upright branches. Lower leaves petiolate, 2.5–4.0 cm long, lamina oval, twice pinnately cut, lobes usually with a pair of secondary lobes, later narrowly linear, 3–5 mm long, short-acuminate; middle cauline leaves sessile, once or twice pinnately cut, with simple linear auricles, upper leaves sessile, at base of branches, linear, 1.0–1.8 cm long. Capitula sessile, oblong-ovate, up to 2.5 mm long, in spicate or spicate-racemose inflorescence. Involucral bracts lanceolate; outer bracts white-tomentose, inner bracts slightly longer, glabrous, only at apex pubescent, with wide scarious margin. Florets 5; corolla yellow.

On mountain slopes.—*Soviet Central Asia*: Pamiro-Alai (eastern part of Alai Range). Endemic. Described from Osh District. Type in Leningrad.

Series 3. Knorringianae Poljak.—Low whitish-tomentose perennials forming compact tussock; leaves once or twice pinnately cut; capitula in simple spicate or racemose-paniculate, narrow inflorescence. Alpine plants.

131. *A. knorringiana* Krasch. in *Izv. Gl. Bot. Sada*, XIV, 4–6 (1914) 463.

Perennial. Whole plant villous-white-tomentose till the end of vegetative growth, 10–12 cm high. Root not very thick, vertical, with short perennial, branched, ascending, nonflowering shoots densely covered with remnants of leaf petioles, nonflowering shoots together with annual and biennial, short, sterile, densely leafy shoots forming low compact tussock; leaf rosettes at apices of shoots in several rows. Leaves petiolate, somewhat thick, 0.5–1.5 cm long, slightly grooved above, lamina oblong-lanceolate or more obtuse and oblong, pinnately cut, lobes 2–3 on each side, rather approximate, usually ternately divided, lobes cuneate, 2–3 mm long; lower cauline leaves less divided, but upper undivided, linear, scarcely acuminate, sometimes even slightly broadened and then carinate on inner side, with characteristic saccate sheath at base covering capitulum from below. Peduncles many, weakly sulcate, slender 2–3 cm high, with narrow, lax, interrupted, simple, spicate inflorescence above. Capitula sometimes on short peduncles enclosed by bracteal leaves enlarged at base, remote, less often 2–3, oblong, up to 5 mm long and up to 2 mm in dia. Outer involucre bracts broadly deltoid, with somewhat convex green keel and scarious wings, villous-tomentose; inner bracts narrowly lanceolate, 589 with scarious margin, sometimes carmine-red. Florets narrowly campanulate, sometimes constricted below, weakly lobed above, limb fluffy, red, 1–2 mm long; stigma in young florets short, in older florets exerted from corolla, apically reddish-brown. Achenes pyriform, up to 2.5 mm long, circular in section, rugose-sulcate, maturing simultaneously.

Alpine zone, on rubbly slopes of mountains.—*Soviet Central Asia*: Pamiro-Alai Region (Alai Valley). Endemic. Described from Alai Range. Type in Leningrad.

132. *A. korovinii* Poljak. in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, XVII (1955) 279.

Perennial. Root woody, vertical with short, perennial, woody, nonflowering ascending shoots forming small, low, lax tussock. Flowering stems sometimes rather numerous, 15–25 cm high, slender, angular, weakly arcuate or straight, initially whitish-tomentose, later subglabrous, reddish below, simple or with short branches at apex, weakly leafy. Leaves on both sides whitish-tomentose; lower most leaves petiolate, 1.5–2.5(3.0) cm long and 0.6–0.8 cm wide; lamina oblong or oval, once or twice pinnately cut, terminal lobes lanceolate, up to 1.5–2.0 mm long, subacuminate; lower and partly middle cauline leaves shorter, short-petiolate or sessile, simple pinnate, lobes undivided or incised-toothed; upper bracteal leaves mostly simple, sessile, short-lanceolate, acuminate, sometimes with 2 small lateral lobes at base. Capitula in narrow, lax raceme or racemose panicle, ovate, mature capitula 3–4 mm long, usually sessile, very crowded. Outer involucrel bracts elliptical, hairy, inner scarcely longer, narrowly lanceolate, more or less glabrous, with scarious margin. Florets 4–5, purple. Flowering August.

Flat clayey places in mountains.—*Soviet Central Asia*: Pamiro-Alai (Alai River valley). Endemic. Described from Alai River valley. Type in Tashkent.

Series 4. *Pauciflorae* Poljak.—Flowering stems more or less numerous, slender, brownish at the end of vegetative growth, glabrous or white-tomentose; perennial, woody, short; nonflowering shoots forming quite compact tussock.

133. ***A. pauciflora*** Web. in Stechm. Artem. (1775) 26; Willd. Sp. pl. III, 3, 1828; DC. Prodr. VI, 102; Keller, V Oblasti Polupustyni, 104–109; Kryl. Fl. Alt. III, 638; Fedtsch. Perech. Rast. Turk. IV, 194; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 356; Kryl. Fl. Zap. Sib. XI, 2785; Poljak. in Majeovski, Fl. 584.—*A. maritima* v. *stechmanniana* Bess. in Bull. Soc. Nat. Mosc. VII (1834) 31.—*A. maritima* var. *pauciflora* Ldb. Fl. Ross. II, 2 (1845) 570.—*A. pauciflora* Web. ssp. *maikara* Krasch. in Otch. o Rab. Pochv.-Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 273.—*A. maikara* (Krasch.) Pavl. Fl. Tsent. Kazakhst. III (1938) 270.—**Exs.**: GRF Nos. 3193a, 3193b.

Perennial shrub, 10–25 cm high. Root vertical, woody, with perennial, woody, short, prostrate or somewhat ascending nonflowering shoots forming quite compact tussock with short, annual, leafy shoots. Flowering stems numerous, slender, virgate, usually ascending, in summer brown, glabrous, branched above, with upward directed slender branches. Leaves grayish-greenish, densely hairy, later partly glabrous,

sometimes subglabrous, punctate-glandular; lower leaves withering early, petiolate, twice or thrice pinnately cut, their terminal lobes linear-lanceolate, very small; middle cauline leaves sessile, less divided; upper leaves undivided, very small, linear. Capitula in narrow, compact, paniculate inflorescence, sessile or on short peduncles, ovoid or oblong, 2 mm long, spicately crowded or somewhat widely spaced. Involucral bracts punctate-glandular, with scarious margin; outer bracts small, oval, more or less hairy, inner bracts larger, oblong-elliptical, subglabrous. Florets 3; corolla yellow or purple; anthers linear, apical appendages of anthers acute, subulate, basal appendages inconspicuous, round; stigma lobes linear, short, truncate, short-ciliate, divergent. Flowering August.

Abundant in steppe zone; depressions, dry ravines, river terraces above floodline, eroded clayey foothill slopes of [mud] volcanic cones, usually on hard crusty columnar alkaline soils.—*European part*: Lower Volga; *Western Siberia*: Upper Tobol (southern part), Irtysh (southern part); *Soviet Central Asia*: Aralo-Caspian Region (northern part), Lake Balkhash Region. Endemic. Described from the Lower Volga. Type in Berlin.

Note. According to the observations of P.P. Poljakov, ssp. *maikara*, described by I.M. Krascheninnikov, grows with *A. pauciflora*; and it is distinguished only by elongated and more divergent or drooping branches and capitula. These characters are inadequate for the rank of subspecies and the more so for species status.

I think it is more correct to treat ssp. *maikara* Krasch. as an ecological form—*A. pauciflora* Web. f. *maikara* (Krasch.) Poljak.

Economic Importance. The plants contain 0.52–0.54% essential oil (Kazakevich and Sobolevskaya, 1928); carotene, from 4.5–5.0 (early spring) to 11–32 (summer) mg/kg (Troitsky, 1950). On the average, based on 10 samples, it contains (absolute dry weight, in %) Ca—0.737; P—0.251; and on the basis of two analyses: K—0.872, Na—1.415, Mg—0.139, S—0.324, and Cl—0.550 (Taime and others, 1948). During the developmental stage it contains a large quantity (4.21%) of water-soluble carbohydrates (Larin and others, 1928). According to 591 the data of Larin, Aleksandrovsky, Davydov, Evseev, Bannikov, and others, it contains (based on absolute dry weight, in %) ash—7.1, [total] proteins—12.1, soluble protein—9.3, fat—4.9, cellulose—31.3, and nitrogen-free extractable substances—44.6. The dynamics of nutrients is rather well explained in the work of Shakhov and zemtsova (1948). The nutritive value of this wormwood has been studied in seven experiments on digestibility; of greatest interest are the experiments of Bannikov (1940). The plants are relished by sheep, goats, horses, and camels; they are rarely if ever eaten by cattle in pastures (Larin, 1956).

134. *A. gracilescens* Krasch. and Iljin in Sistemat. Zap. Gerb. Tomsk. Univ. 1-2 (1949) 2, 3; Kryl. Fl. Zap. Sib. XI, 2786.—*A. lercheana* Ldb. Fl. Alt. IV, p. 85, quoad. pl. songor.—*A. pauciflora* Kryl. Fl. Alt. III (1904) 638, partim.—*lc.*: Ldb. Ic. pl. Fl. Ross. V, t. 488.

Perennial. Root thick, vertical, woody, in old plants vertically split into several parts, with numerous, perennial, woody prostrate or weakly ascending short vegetative shoots, forming rather compact low tussocks together with short, annual, sterile, leafy shoots. Flowering stems usually rather numerous, slender, 15-30 cm high, finely grayish-tomentose, partly glabrous in fall, branched in upper half, with obliquely upright branches, usually highly shortened. Leaves grayish-tomentose and punctate-glandular; lower cauline leaves and leaves of nonflowering shoots with strongly expanded base, persisting only in first half of vegetative period, later withering, 1-2 cm long and 0.6-1.0 cm wide, twice- or thrice-pinnately cut, with 2-3 lobes on each side, terminal lobes filiform-linear, acuminate, or subobtusate, slightly thickened, usually with distinct midrib beneath; middle cauline leaves less divided, uppermost leaves undivided, small, linear. Capitula sessile, upright, oblong, 2.0-2.5 mm long and 1 mm in dia, spicately crowded or somewhat distant from each other, in narrowly pyramidal panicle. Involucral bracts dorsally punctate-glandular, with scarious margin; outer bracts small, oval-elliptical or oval, hairy, inner oblong-lanceolate, lustrous, weakly hairy. Florets 2-5; corolla yellow; anthers narrowly linear, apical appendages of anthers acute, basal appendages almost undeveloped; stigma lobes short, short-ciliate, somewhat divergent. Flowering August.

Saline, rubbly slopes and also flat lands, on alkali soils.—*Western Siberia*: Irtysh (southeast); *Soviet Central Asia*: Lake Balkhash Region (east). *General distribution*: Mongolia. Described from Kulunda steppe. Type in Tomsk.

Economic Importance. According to the data of M.I. Goryaev, A.T. Petushkova, and N.A. Sviridova (1954), about 0.1-0.5% alkaloids have been found in plants of this species.

592 135. *A. terrae-albae* Krasch. in Otch. o Rab. Pochv.-Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 269; Kryl. Fl. Zap. Sib. XI, 2787; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 17, 18, 27, 94.—*A. maritima* Bess. *terrae-albae* Krasch. in Sistemat. Zam. Gerb. Gl. Bot. Sada, II (1921) 187, nom.—*A. suaveolens* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 274.—*A. heptapotamica* Poljak. Ibid., 278.—*Exs.*: GRF No. 3192.

Perennial. Whole plant white when young, later grayish-greenish from arachnoid tomentum. Root thick, vertical, woody, in older plants often vertically split into several parts, with perennial, woody, short, prostrate and weakly ascending shoots forming rather compact tussock. Annual, nonflowering shoots numerous, 3–5 cm long bearing rosettes of leaves of summer growth. Flowering stems numerous, weak, slender, somewhat flexuous, 15–30 cm high, branched in upper half, with usually short branches spreading at 60–90°, or with longer, obliquely upward directed branches. Leaves in beginning of vegetative growth wither and fall off, once or twice pinnately cut; basal leaves 1–2 cm long, terminal lobes small, filiform-linear, upper leaves small, undivided, linear. Capitula pedunculate, small, 2–3 mm long, ovate, erect or sometimes drooping, remote in lax, rather broad panicle. Involucral bracts many-whorled, imbricate, outer bracts very small, succulent, dorsally convex, covered with short tomentum, oval, inner much longer, weakly convex, glabrous, with scarious border, oblong-lanceolate, subobtuse or somewhat acuminate. Florets (4–5) at maturity with spreading corolla, purple-pink or yellow; staminal filaments shorter than anthers; stigma lobes short, after anthesis divergent, at apex with dense tuft of erect cilia. Flowering August.

Mainly on clayey, brown, leached desert soils.—*Soviet Central Asia*: Lower Volga (Caspian Sea Region), Aralo-Caspian Region (Ust-Urt), Kyzyl-Kum, Lake Balkhash Region. *General distribution*: Mongolia. Described from Betpak-Dal desert, the Sarysuk River. Type in Leningrad.

Note. The following varieties should be recognized:

1) Var. *massagetovii* Krasch. (Kryl. *Fl. Zap. Sib.* XI, 2787)—distinguished by relatively thicker, stronger and higher (30–40 cm) stems, broadly oblong paniculate inflorescence, and large capitula; Lake Balkhash Region (Muyun-Kum, Balkhash-Alakul, Zaisan);

2) Var. *semiarida* Krasch. and Lavr.—distinguished by fewer and rather tall (20–35 cm) stems, narrowly pyramidal panicle, and obliquely upright branches; desert-steppes: Lake Balkhash Region (Karaganda Region, Zaisan);

593 3) Var. *suaveolens* Poljak.—distinguished by short (8–15 cm high) stems, large capitula that are 3–4(5) mm long and 2–3 mm wide, usually approximate, upright; southern Lake Balkhash Region, Ili River valley;

4) Var. *heptapotamica* Poljak.—distinguished by narrow, rather dense, pyramidal panicle; northern Tien Shan, intermontane plains.

5) Var. *kurdaica* Poljak.—distinguished by thick stems, short branches, and dense pubescence on entire plant; according to the data of R.N. Sazonova (1959), the plants collected near Kurdai Pass (Trans-Ili Alatau) contain 2.04% santolin; the yield of essential oil was 1.8%; the oil contains aldehydes and cineole.

Economic Importance. According to the data of M.I. Goryaev (1954), the essential oil of *A. terrae-albae* Krasch. contains cineole—8%, 1-camphor—37%, cumaldehyde—6%; borneole—7%, and presumably artemisiaketone* —about 14%. According to the data of E.I. Saudarova, the essential oil of *A. terrae albae* var. *massagatovii* Krasch. contains the following components: 1) carbonyl compounds (camphors 95.36% by weight of the oil, and carvone comprising 1.19% by weight of the oil; this substance was found for the first time in wormwood essential oils); 2) alcohols and complex esters: *Cis-pikomfeol**—0.6%; *Trans-pikomfeol**—0.79%; bornyl ester of isovaleric acid—0.55%; crystalline alcohol of unknown structure with a melting point of 47%[sic.], comprising 0.48% of the oil by weight; 3) phenol—0.05%, and 4) acid 0.09%. According to the data of R.N. Sazonova, it contains up to 0.37% santonin.

According to the data of Makhmudov, the nutritive value of this wormwood, during the vegetative growth phase, is close to that of oats (Larin). One hundred kilograms of absolutely dry fodder contains 9.4 kg of digestible protein and 93.8 feed units. At the flowering stage, the fodder contains 2.8 kg of digestible protein and 46.5 feed units. In winter its nutritive value is low: 2.5 kg of digestible protein and 24.7 feed units. In the opinion of Larin, this wormwood is greatly relished by sheep in the spring, satisfactorily to poorly in the summer, and greatly in the fall and winter. Horses and camels relish it less. The data about its feed value for cattle are inadequate.

According to the studies of M.I. Goryaev, E.I. Glyadkovskaya and I.M. Shabanov (1951), a mixture of the three species (*A. terrae albae* Krasch., *A. serotina* Bge., and *A. leucodes* Schrenk), steam-processed to extract the essential oil, does not lose its fodder value and is eaten by big horn cattle better than the mixture containing the essential oil. Steam treatment removes from the fodder the substances that impart poor taste for the animals. An experiment of making silage from the green mass (after removal of the essential oil) of succulent feeds (bagasses, watermelon, pumpkin) showed that the fodder is entirely of good quality for cattle.

Series 5. Lessingianae Poljak.—Plants grayish from pubescence, later subglabrous, sometimes completely glabrous or even whitish-tomentose; lower leaves pinnatisect or twice pinnately cut, terminal lobes narrowly linear, acute.

*The name of the compound could not be confirmed — General Editor.

136. *A. lessingiana* Bess. in Linnaea, XV (1841) 90, 103; Fedtsch. Perech. Rast. Turk. IV, 195; Krascheninn. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 356.—*A. taurica* Less. in Linnaea, IX (1834) 170, 190, non Willd.; Ldb. Fl. Ross. II, 2 (1846) 575, pro parte, quoad plant. Lessing. (v. spec. auth.).—**Exs.:** GRF No. 3194a, b.

Perennial. Plant pubescent, later subglabrous. Root thick, woody, with perennial, weakly ascending, woody, short, nonflowering shoots forming rather dense, lax, small tussocks with short, young, leafy shoots. Flowering stems rather numerous, ascending or almost erect, 18–30(40) cm high, branched above, with short, upright branches. Most leaves weakly hairy or glabrous, or arachnoid-tomentose (f. *canescens* Krasch.); leaves of vegetative shoots and lower cauline leaves petiolate, 2–5 cm long, their laminae oblong-oval, once or twice pinnately cut terminal lobes linear-filiform, 5–10 mm long, keeled at base, green; upper cauline and bracteal leaves smaller, simple, narrowly linear or with a pair of small lateral lobes at base. Capitula sessile or on short peduncles, oblong-ovoid, 3–4 mm long, in narrowly racemose-paniculate inflorescence. Outer involucre bracts small, oval-lanceolate; inner bracts longer, linear-lanceolate, with scarious margin. Florets 5–6, corolla purple-pink or yellow; anthers linear, apical appendages of anthers subulate, basal appendages short-acuminate; style at maturity of achenes as long as stamens; stigma lobes linear, erect, truncate, short-ciliate. Flowering August.

Steppe region, on rubbly slopes of [mud] volcanic cones, chalk outcrops, sometimes on chestnut, solonchik and clayey soils.—*Western Siberia*: Upper Tobol (southern part of the Urals and the whole of Syrt.); *Soviet Central Asia*: Aralo-Caspian Region (Mugodzhary). Endemic. Described from Orenburg Region. Type in Kiev.

According to the data of M.I. Goryaev, T.E. Serkebaeva, L.A. Ignatova, and I.M. Shabanov (1951), the yield of essential oil from the air-dried matter is 0.46%. The oil contains 59.4% carbonyl compounds, of which camphors constitute 43.8%; the carbonyl liquid compounds of aldehyde nature are tentatively related to methylheptane.

137. *A. aralensis* Krasch. in Spisok Rast. Gerb. Fl. SSSR, X (1936) 105.—**Exs.:** GRF No. 3196.

595 Perennial. Plant 30–50 cm high, grayish-green in early vegetative growth period from more or less dense, arachnoid hairs, later glabrous, with distinct lemony fragrance. Root rather thick, woody, vertical, with perennial, short, branched, woody, nonflowering shoots covered with grayish bark. Flowering shoots numerous, slender, virgate, (20)25–40 cm high, in lower part stramineous-brownish smooth, in upper half green, branched with short, more or less divergent branches. Leaves

hairy, later subglabrous, densely glandular, yellowish-green, 2–3 cm long, lamina oblong-lanceolate, twice pinnately cut, terminal lobes remote, succulent, 4–5 mm long and 0.5–1.0 mm wide, linear, short-acuminate; leaves of vegetative shoots and lower cauline leaves petiolate; middle cauline leaves sessile; upper leaves undivided, linear. Capitula pedunculate or sessile, ovate-oblong, 2–3 cm long, remote or on apices of branches, 2–3, drooping or even divergent, in oblong-pyramidal panicle. Involucre many-whorled, strongly glandular; outer involucre bracts small, round, dorsally convex, pubescent, inner bracts lanceolate or oval-oblong, glabrous, greenish, with scarious border. Florets 3–4; corolla yellow; anthers linear; apical appendages of anthers acute, basal appendages smaller, acute; style short; stigma lobes linear, erect, apically truncate, short-ciliate. Flowering August.

Clayey, sandy loam, solonetzic soils.—*Soviet Central Asia*: Aralo-Caspian (northern Aral) Region. Endemic. Described from southeastern part of Aktyuba Region, Kara-Chokat. Type in Leningrad.

138. **A. camolorum** Krasch. in Otch. o Rab. Pochv.-bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 272.

Perennial shrub 12–15(30) cm high, more or less hairy, later subglabrous. Root 4–8 mm thick, woody, with perennial, woody, prostrate or ascending, strongly branched, nonflowering shoots forming small tussocks. Flowering shoots numerous, slender, strong, straight or basally arcuate, branched above, with short, divergent branches. Lower leaves petiolate, 1–2 cm long, oblong-linear, twice pinnately cut, lobes with 2–3 linear, short, 1–2 mm long, acuminate secondary lobes; middle cauline leaves smaller, simple pinnate, upper leaves undivided, linear, sometimes with a pair of small lateral lobes at base. Inflorescence oblong, paniculate. Capitula on short peduncles or sessile, narrow-oblong, 2–3 mm long, at maturity divergent, more or less remote. Involucre 3-rowed; outer involucre bracts small, round, grayish-pubescent, inner bracts oblong or prolate, with scarious, brownish-red, lustrous margin. Receptacle rather small, convex. Florets 2–4; corolla yellow; anthers linear, apical appendages of anthers obtuse, basal appendages weakly developed, roundish; style shorter than stamens; stigma lobes linear, erect, truncate, short-ciliate. Flowering August.

Depressions, ravines, old river terraces, puffy salt marshes, cloddy solonetz soils, as well as on outcrops of colored saline clays.—*Soviet*
596 *Central Asia*: Aralo-Caspian Region, Lake Balkhash Region (western part). Endemic. Described from Turgai (Aktyuba Region). Type in Leningrad.

Series 6. Sublessingianae Poljak.—Leaves simple pinnate or usually twice or even thrice pinnately cut into narrowly linear or linear

lobes; inflorescence narrowly paniculate; plants glabrous or subglabrous only at end of vegetative growth.

139. **A. sublessingiana** (Kell.) Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 395; Krascheninn. in Spisok Rast. Gerb. Fl. SSSR, X, No. 3195; Kryl. Fl. Zap. Sib. XI, 2788.—*A. maritima* var. *sublessingiana* Kell. Bot. Geogr. Issled. Zais. u. Semipalat. Obl. II (1912) 89–93, nomen.—*A. lessingiana* Kryl. Fl. Alt. III (1904) 640, non Bess.—*A. gorjaevii* Poljak. op. cit. 420.—*A. polystricha* Poljak. ibid., 420.—**lc.**: Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV (1959) 92.—**Exs.**: GRF No. 3195.

Perennial. Tap root woody, with short, perennial, ascending, woody, nonflowering shoots covered with brownish bark shredding into fibers. Flowering shoots erect, usually numerous, 30–45 cm high, arachnoid-hairy, later subglabrous, particularly in lower part, branches above, with somewhat divergent branches. Leaves grayish, hairy, later subglabrous; lower leaves long-petiolate, 3–4 cm long, their laminae oblong-oval, twice pinnatisect, terminal lobes linear-filiform, 5–12 mm long, subacuminate; middle cauline leaves sessile, pinnate, with palmatisect, sometimes pinnatisect auricles; uppermost bracteal leaves undivided, linear. Capitula sessile, oblong-ovate, 2–3 mm long, mostly approximate, in groups of few in rather narrow panicle. Involucral bracts oblong, slightly convex, dorsally densely hairy; inner bracts with wide scarious border. Florets 3–8; corolla yellow, anthers on short filaments, linear, apical appendages of anthers acute, basal appendages shorter, acute; style short. Receptacle quite small, convex. Flowering August.

Rubbly and stony slopes of [mud] volcanic cones.—*Western Siberia*: Irtysh (south), Altai (southwest); *Soviet Central Asia*: Lake Balkhash Region, Aralo-Caspian (only northeastern) Region, Dzhungaria-Tarbagatai. Endemic. Described from southern Lake Balkhash Region. Type in Leningrad.

According to the data of M.I. Goryaev, A.T. Petushkova, and N.A. Sviridova, about 0.1–0.5% alkaloids were found in samples of *A. sublessingiana*.

Note. The following varieties should be recognized:

- 1) Var. *gorjaevii* Poljak.—distinguished by slender stems that are usually 20–30 cm high and leaf lobes that are narrowly linear, short (1–3 mm) and triangular; foot-hills of Dzhungarian Alatau and 597 Tarbagatai. According to the studies of R.N. Sazonova, it contains up to 1.24% santonin; the essential oil contains up to 70% cineole and many azulene-forming sesquiterpenes.

2) Var. *polystichum* Poljak.—distinguished by the lower cauline leaves that are smaller (up to 2 cm and not 3–4 cm), small leaf lobes, and 3, rarely 2, stigmatic lobes; Chu-Ili Mountains.

140. *A. transiliensis* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 417; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV (1959) 70.—**lc.**: Poljak. *ibid.*, 71.

Perennial. Root woody, thick, with short, ascending, perennial, woody nonflowering shoots covered with brownish cracking bark. Flowering shoots 40–65(75) cm high, rather numerous, erect, grayish, arachnoid-hairy, later, particularly in lower part, subglabrous, brownish, branched above, with moderately divergent long branches. Leaves grayish-green, hairy; lower cauline leaves and leaves of vegetative shoots withering early, long-petiolate, 3.5–6.0 mm long, oblong, twice pinnately cut, terminal lobes narrowly linear, 4–8 mm long, with short stiff apices; middle cauline leaves smaller, short-petiolate, with pinnately cut auricles; upper bracteal leaves simple, very small, linear. Capitula pedunculate, upright or divergent, oblong-ovoid, 3 mm long, somewhat remote or in groups of few in narrow, dense panicle. Outer involucre bracts small, oval, densely hairy, inner larger, oblong, green, with occasional hairs, mixed with white cystiform hairs, with broad scarious margin. Receptacle about 1 mm, obtusely conical. Florets 3–5; corolla pink or yellow; stamens and style at maturity exerted; anthers linear, apical appendages of anthers subulate, basal appendages shorter, subobtusate, stigma lobes weakly divergent, with tuft of short erect cilia at apex. Achenes somewhat flat, pyriform, up to 1.5 mm long. Flowering August.

Loessial meadow-steppe slopes of foothills.—*Soviet Central Asia*: Tien Shan (Trans-Ili Alatau). Endemic. Described from vicinity of Alma-Ata. Type in Leningrad.

Note. Var. *boamensis* Poljak., characterized by taller stems and a narrowly pyramidal panicle, should be recognized. According to the data of R.N. Sazonova, the plants of this variety growing in the Boam gorge (Kirghiz Alatau) contain up to 5.124% santonin.

Economic Importance. According to the data of M.I. Goryaev (1952), the yield of essential oil was 0.534% in terms of absolute dry matter. The oil contains cineole—68%, free organic acids—7%, phenols—4.65%, aldehydes and ketones—16%. In samples of this wormwood, about 0.1–0.5% alkaloids was found (Goryaev, Petushkova, and Sviridova). The santonin content in this species is not any lower than in *A. cina* (R.N. Sazonova).

According to the data of M.I. Goryaev and M.G. Pugachev (1955), the composition of the essential oil is: formic acid (0.1%), isobutyric

acid (0.086%), m-cresol (1.5%), α -pinene (traces), cineole (55–56%), thujyl alcohol (4–5%), complex ester of thujyl alcohol and an unidentified acid (6–7%), cumaldehyde (7.5%), thujone (14.0–17.5) (mixture of α - and β -forms), and sesquiterpenic alcohol (not identified). The oil extracted from the distillate contains formic acid (12.33%), isobutyric acid (27.27%), phenols (56.7%), and cineole (5.2%). In the multipurpose exploitation of the plant, its essential oil may be used for extracting cineole and as a surface-active substance.

141. *A. tenuisecta* Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, ser. 1, No. 4 (1937) 284.—*A. grigorievi* Krasch. ex Nevski, nomen in *ibid.*, 284.—*A. karatavica* Krasch. and Abol. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 397.—*A. glaucina* Krasch. ex Poljak. *ibid.*, 413.—*A. mucronulata* Poljak. *ibid.*, 419.—*Ic.*: Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV (1959) 90, sub *A. glaucina*.

Perennial. Semishrub, 35–60(70) cm high, with thick, strongly branched, short, perennial, woody, nonflowering shoots covered with brownish-gray cracking bark. Flowering shoots numerous, erect or ascending, slender, virgate, 15–40(50) cm high, grayish from dense arachnoid hairs, later partly glabrous, branched above, with obliquely spreading branches. Leaves grayish, densely arachnoid-hairy, later more or less glabrous, green; lower cauline leaves short-petiolate, 1.5–2.5 cm long, lamina broadly oval, thrice pinnately cut, terminal lobes narrowly linear, 2.0–3.5 mm long; upper leaves sessile, once or twice pinnately cut, uppermost leaves undivided, linear. Capitula sessile or subsessile, ovoid-oblong, up to 3 mm long, remote or spicately crowded on branches in narrow panicles. Involucral bracts pale brownish, smooth, with scarious margin. Florets 3–7; corolla yellow or pinkish; anthers on shorter filaments, linear, apical appendages of anthers narrow, almost subulate, basal appendages very short, obtuse; stigma lobes short, linear, obtuse, with erect cilia. Flowering August.

Clayey and rubbly-clayey mountain slopes.—*Soviet Central Asia*: Tien Shan, Pamiro-Alai Region. Endemic. Described from southeastern Turkmenia, Kugitang Range. Type in Leningrad.

Note. The following varieties should be recognized:

- 1) Var. *karataviensis* Poljak.—distinguished by bi- or almost tripinnatisect lower leaves, longer (4–6 mm long and not 2.0–3.5 mm) terminal leaf lobes and a relatively weak pubescence over the whole plant; found in Syr-Darya Region of Karatau. According to the data of M.I. Goryaev and R.N. Sazonova (1959), the plant contains 0.22–0.33% santonin. It is interesting that some samples of this variety did not contain santonin. The yield of essential oil varies from 0.6 to 1.7%. The oil contains a large percentage of camphors as well as

aldehydes, ketones, phenols, azulene-forming sesquiterpenes, alcohols, acids, and complex esters. Variation in the contents of organic acids and esters is especially noticeable.

2) Var. *glaucina* Poljak.—distinguished by bipinnatisect lower leaves and sparse pubescence; Tien Shan (Chatkal Range), Pamiro-Alai (Turkestan Range). According to the studies of M.I. Goryaev and R.N. Sazonova (1959), the plant contains 1.2–1.9% santonin. The essential oil contains up to 70% cineole. Alkaloids are also present (M. Goryaev, G.K. Kruglykhina, and E.I. Satdarova, 1959).

3) Var. *mucronulata* Poljak.—distinguished, in general, by shorter stems (15–25 cm high), capitula with fewer (3–4) florets, and abundant pubescence of the whole plant, persisting up to the end of the vegetative phase; typical of the highest mountains of the Syr-Darya part of Karatau.

142. **A. kaschgarica** Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 3 (1936) 350.

Perennial. Plant grayish from dense arachnoid hairs in early vegetative phase, later subglabrous. Root vertical, woody, rather thick, with perennial, woody, nonflowering shoots. Flowering shoots more or less numerous, stiff, erect, up to 30–35 cm high, branched from base or in lower part, with slender, virgate, long (lower branches up to 10–25 cm), more or less arcuate branches. Leaves stiff, somewhat thick, highly variable; lower and middle cauline leaves 1.5–2.0 cm long, once or twice pinnately cut, sometimes simple, linear, sub-obtuse or divided into 2–3 lobes; upper leaves simple, linear. Capitula sessile or on short peduncle, ovoid, cuneately narrowed at base, 4–5 mm long, in rather wide, subglobose panicle. Involucral bracts green at maturity, strongly recurved and easily detached, with scarious border; outer bracts small, oval, dorsally convex, inner larger, oblong-lanceolate or lanceolate. Florets 4–5; corolla purple-red; anthers linear, on more or less long filaments, apical appendages of anthers almost subulate, acuminate, basal appendages smaller, subobtusate; stigma lobes linear, truncate, short-ciliate, after anthesis divergent. Flowering August.

Stony-rubblly slopes of lower mountains, rubblly desert plains. Sometimes on gravel beds of rivers.—*Soviet Central Asia*: Lake Balkhash Region (near Zaisan, Takhta and Dzsharkent). *General distribution*: Dzhungaria-Kashgaria. Described from northern Kashgar. Type in Leningrad.

600 **Economic Importance.** According to the data of M.I. Goryaev and R.N. Sazonova (1959), it contains 1.5% essential oil; aldehydes, ketones, cineole, and azulene-forming sesquiterpenes were found as constituents of the oil.

143. *A. amoena* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1959) 421.—*Is.*: Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV (1954) 91.

Perennial. Plant 18–30 cm high, arachnoid white-tomentose up to the end of vegetative phase. Root thick, woody, with perennial, short, prostrate or ascending, woody, non-flowering shoots forming low, rather compact tussocks together with short, young, leafy shoots. Stems usually 10–15, erect, 15–28 cm high and up to 1.5 mm thick, branched above, with short (up to 2–3 cm long), upright branches. Leaves of nonflowering shoots and lower cauline leaves long-petiolate, 4–8 cm long, lamina oval, once or twice pinnately parted; lobes 3–5 pairs; terminal lobes linear, 4–12 mm long and 1 mm wide, flat with cartilaginous apex; middle cauline leaves smaller, sessile or short-petiolate, simple pinnatipartite, with simple linear auricles; uppermost leaves linear, up to 4 mm long. Capitula sessile, ovoid, up to 4 mm long and 2 mm in dia, borne in narrowly spicate or spicate-paniculate inflorescence. Involucral bracts with cystiform hairs, with scarious border; outer bracts oval, densely hairy, inner larger, oblong-elliptical, somewhat flat, green dorsally, subglabrous, only with occasional hairs at apex. Florets 4–5, corolla yellow or pink; anthers on long filaments, linear, apical appendages of anthers subulate, basal appendages almost undeveloped; stigma lobes and style thickened along margin, divergent, with tuft of strongly divergent cilia at apex. Flowering August.

Stony slopes of granitic lower mountains.—*Soviet Central Asia*: Lake Balkhash Region (southern edge of Altai Mountains). Endemic. Described from Marka-Kul District. Type in Leningrad.

Economic Importance. According to the data of M.I. Goryaev, A.I. Petushkova, and N.A. Sviridova, the plant contains about 0.1–0.5% alkaloids. According to the studies of R.N. Sazonova (1952), the plant contains 0.79% santonin. The essential oil has a high cineole content; the yield of essential oil is 0.79%.

144. *A. fedtschenkoana* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser.1, No. 3 (1936) 351; Bot. Mat. Gerb. Gl. Bot. Sada, II, 44, 186, nomen.—*A. issykkulensis* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 415.

Perennial. Root woody, vertical, 3–8(15) mm thick, with short, perennial, woody, ascending nonflowering, shoots forming tussocks.
601 Flowering shoots very numerous, 16–30(35) cm high, slender, virgate, erect, grayish, hairy, later glabrous, branched above, with short, usually up to 2–6 cm long, slender, more or less weakly divergent branches. Leaves of nonflowering shoots and lower cauline leaves hairy, petiolate, 1.5–3.0 cm long, lamina oval or oblong, 10–12 mm wide, twice

pinnately cut, with 2–4 pairs of lobes, terminal lobes linear or linear-spatulate, somewhat succulent, 2–3 mm long, with short, cartilaginous apex; middle cauline leaves smaller, sessile, pinnatisect or simple, linear; upper leaves small, linear. Capitula sessile, ovate, 2.3–3.0 mm long, erect, remote, in narrowly paniculate inflorescence. Involucral bracts greenish dorsally, hairy or glabrous, lustrous, with brownish scarious border; outer bracts small, oval-deltoid, inner bracts larger, oblong-lanceolate. Florets 2–3–5. Achenes brown, 1.0–0.5 mm long.

Alkaline steppes, meadows.—*Soviet Central Asia*: Tien Shan (Tersk Alatau). *General distribution*: Dzhungaria—Kashgaria. Described from southeastern Kashgaria. Type in Leningrad.

Note. Var. *issykkulensis* Poljak., which is distinguished by somewhat thickened stems, a many-headed, narrowly pyramidal panicle, capitula with 3–5 (and not 2–3) flowers and large achenes (up to 1 mm long and not 0.5 mm), should be recognized. Central Tien Shan (Issyk-Kul Basin).

145. *A. cina* Berg. ex Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV (1959) 69.—*A. cina* Berg. in Darstell. IV (1863) tab. 29°, nomen provisorium; Fedtsch. Perech. Rast. Turk. IV, 194.—*A. contra* Schachn. Issl. Tsitv. Polyni (1899).—*A. maritima* Bess. f. *fragrans* Rgl. in herb.—*A. mogoltavica* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 416.—**lc.**: Shakhnazarov (1899) 13; Tr. Inst. Khim. Akad. Nauk SSSR, IV, 88.

Perennial. Plant 25–35(40) cm high, arachnoid-hairy in early vegetative phase, later glabrous. Root vertical, woody, with short, perennial, woolly, ascending; non-flowering shoots covered with brownish-gray cracking bark. Flowering shoots numerous, 18–30(40) cm high, rather slender, virgate, erect, sometimes basally arachnoid-hairy, in second half of summer brown, glabrous, lustrous, branched above, with very slender, erect branches. Leaves of vegetative shoots and lower cauline leaves withering early, long-petiolate, 2.5–4.0 cm long, lamina oval, twice pinnately cut, terminal lobes narrowly linear, 2–5 mm long, short-acuminate; middle cauline leaves subsessile, less divided, with pinnately cut auricles; uppermost leaves sessile, undivided, linear, small. Capitula sessile, erect, oblong-ovoid, up to 3 mm long, spicately crowded on branches in narrow, compact panicle. Involucre many-rowed, imbricate; involucral bracts smooth, lustrous, green, with scarious margin; outer bracts small, oval; inner bracts larger, oblong. Florets 3–5; corolla yellow or purple; anthers on short filaments, linear, apical appendages of anthers acuminate, basal appendages shorter, acute; stigma lobes oblong, weakly divergent, with tuft of erect cilia at apex. Achenes about 1–2 mm long, ovoid, somewhat flat. Flowering August.

Flat plains, ravines, terraces above the floodplains, saline soils.—*Soviet Central Asia*: Syr-Darya, Tien Shan. Endemic. Described from southern Kazakhstan. Type in Leningrad.

Note 1. The name *A. cina* Berg. is not valid because it is not accompanied by a description and is indicated as a provisional name (nomen provisorium) uniting several species of *Seriphidium* with capitula having anthelmintic properties. Moreover, in the words of the author, *Artemisia cina* Berg. unites three trade cultivars:

1) Levant Stock.—*Cinae levantici*—a medicinal cultivar of unknown origin. It grows in Persia and Bukhara; it was collected there and brought to Petersburg or Moscow by the caravans of Russian traders. This cultivar has been considered as one of the best.

2) Russian santonica stock—*Cinae rossici*—collected from the steppes along the banks of the Volga River near Sarepta and Saratov. Two varieties are distinguished: a) capitula of *Artemisia pauciflora* and *A. monogyna*; and b) capitula of *A. lerceana*.

3) *Cinae barbarici*, consisting of *A. ramosa* which grows in north-eastern Africa.

Besides similar explanations, in the particular work on plate No. 29 there are illustrations of a transverse section of the capitulum and of the inner involucre bract, referred by the author to *A. cina*. However, these scanty details, in my opinion, are not sufficient criteria to accept the above name. On the basis of these considerations, I myself compiled the description of this, the santonica wormwood.

Economic Importance. It is the main raw material for obtaining an anthelmintic preparation, viz. santonin.

According to the data of M.I. Goryaev, L.A. Ignatova, and I.M. Shabanov (1953), the presence of 6% carbonyl compounds, mainly as a mixture of α - and β -thujone, has been established for the first time in the essential oil of *A. cina* (Berg.) Poljak. The presence or absence of a small quantity of thujone in some oil samples is possibly because its accumulation occurs at a much later stage of the plant's development, when the processes of assimilation and growth slow down considerably. The oil also contains 5–7% of thujyl alcohol. Cineole is the major constituent (up to 80%) of the oil. It contains a poisonous substance—santonin $C_{15}H_{18}O_3$; traces of alkaloids have also been found (Massagetov, 1947). The dried capitula under the name santonica seed (from the Italian "*Semen Zina*") are used in medicine as an excellent anthelmintic. The reports about the edibility of this wormwood for cattle are contradictory.

Note 2. Var. *mogoltavice* Poljak. should be recognized. It is distinguished by more or less elongate and divergent shoots, usually somewhat smaller lower leaves and hairy involucre bracts. It grows

near the Mogoltau Mountains (Mirzarobad natural boundary) and contains 2.6–2.9% santonin. According to the studies of M.I. Goryaev, I.M. Shabanov, and L.A. Ignatova, the essential oil of var. *mogoltavica* Poljak. contains: 1) 30.77% carbonyl compounds, of them 17.44% camphors and the rest consisting of a mixture, which presumably includes thujone; 2) cineole—12.3%; 3) free alcohols 8.72% and bound alcohols as esters—10.04%. It contains almost the same quantity of santonin as *A. cina* (Berg.) Poljak. Thickets of this variety were used until 1952 as raw material for obtaining santonin. At present, their area has shrunk considerably.

Note 3. N.V. Pavlov (*Rastitelnye Resursy Yuzhnogo Kazakhstana* [Plant Resources of Southern Kazakhstan], Alma-Ata, 1947) reports a new species, *A. cinoides* Pavl., collected from the Chu-Ili Mountains, which presumably contains 0.24% santonin by dry weight. This report remains a puzzle, since herbarium specimens of this plant are unknown, even a description of it is missing.

146. *A. ciniformis* Krasch. and M. Pop. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 403.

Perennial semishrub 30–45 cm high, subglabrous. Tap root, thick, woody, with few short, perennial, woody, ascending, nonflowering shoots covered with grayish-brown cracking bark. Flowering shoots 10–20 and more, erect or basally arcuate, hairy, later glabrous, smooth, stramineous, branched above, with short (mostly 2–5 cm long), somewhat divergent branches. Leaves of nonflowering shoots and lower cauline leaves most often 1.5–3.0 cm long, with petioles thickened at base, lamina broadly round, twice or thrice pinnately cut, terminal lobes filiform-linear, 2–8 mm long, short-acuminate with pinnately or palmately cut, or even linear auricles; middle cauline leaves subsessile, twice pinnately cut; upper leaves undivided, linear. Capitula sessile, upright or weakly divergent, ovoid, 3–4 mm long, loosely spicate on branches in narrowly paniculate inflorescence. Involucre many-whorled, imbricate; outer bracts small, hairy, inner larger, oblong, glabrous, with wide, scarious margin. Florets 4–5. Flowering August to September.

Clayey, rubbly and stony mountain slopes as well as foothills.—*Soviet Central Asia*: mountainous Turkmenia. Described from Kopetdag. Type in Leningrad.

According to the data of V.A. Vyshensky, 0.4–0.5% essential oil was obtained from plants up to the flowering stage. The total quantity of aldehydes in the oil was up to 16%. A certain quantity of santonin is also present. According to I.V. Larin, it is grazed in pastures during the fall and winter. It contains some quantity of santonin.

147. **A. glanduligera** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 402.

Perennial. Plant 40–65(75) cm high, usually hairy in early vegetative phase, later glabrous, smooth, punctate-glandular. Root vertical, woody, up to 1–5 cm thick, with perennial, erect, woody, nonflowering shoots up to 15 cm long, covered with brown, cracking bark. Flowering shoots 30–50(60) cm high, usually numerous, erect, strong, virgate, stramineous, branched above, with few divergent, short or long branches. Leaves of nonflowering shoots and lower cauline leaves petiolate, 2–3 cm long, lamina oblong, twice or thrice pinnately cut, terminal lobes (2)3–6(7) mm long, linear, short-acuminate; middle cauline leaves subsessile, once or twice pinnately cut, with pinnately cut auricles; uppermost leaves undivided, linear-lanceolate, usually exceeding capitula, keeled. Capitula sessile, at maturity oblong, up to 3 mm long and 2 mm in dia, upright, approximate, or somewhat remote in narrow, compact paniculate inflorescence. Involucre many-whorled, imbricate, outer bracts small, oval, hairy, inner bracts larger, oblong-oval, green dorsally, with wide scarious border. Florets 5; corolla yellow; anthers linear, apical appendages of anthers subulate, basal appendages shorter, sub-acute; style shorter than stamens; stigma lobes short, linear, truncate, ciliate. Flowering September.

Rubbly and clayey mountain slopes.—*Soviet Central Asia*: Pamiro-Alai Region. Endemic. Described from Alai Range. Type in Leningrad.

Series 7. Validae Poljak.—Plants usually not forming tussock, grayish, densely arachnoid-hairy in early vegetative phase, later subglabrous; stems branched with more or less long, divergent branches, 607 lower leaves mostly 3–8 cm long, twice pinnately cut, their terminal lobes linear, usually 3–8 mm long.

148. **A. ferganensis** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad., Nauk SSSR, XVI (1954) 409; Poljak. in Tr. Inst. Khim. Akad. Nauk Kazakh SSR, IV (1959) 119.

Perennial. Plant grayish from woolly tomentum, partly glabrescent by end of vegetative growth. Root thick, woody, vertical with rather short, perennial, woody non-flowering shoots. Flowering shoots few, sometimes very numerous, basally ascending or erect, 40–60(70) cm high, branched above, with long (up to 10–15 cm), strongly divergent branches. Lower leaves long-petiolate, 4–7(8) cm long, lamina oblong, twice pinnately cut, lobes remote, terminal lobes flat, linear, (3)6–9(12) mm long and 0.5–1.0(1.5) mm wide, apically acute or with 2–3 teeth; middle and upper leaves sessile, less divided, with pinnate auricles; upper leaves undivided, linear. Capitula ovate-oblong,



Plate XXIX.

1 — *Artemisia demissa* Krasch., lower cauline leaf, middle and upper cauline leaves, outer involucre bract, inner involucre bract, peripheral pistillate floret, rudiment of pistil of disk floret, achene. 2 — *A. ledebouriana* Bess., upper part of plant, achene, outer involucre bract; inner involucre bract, lower cauline leaf. 3 — *A. borealis* Pall., habit, staminate disk floret, rudiment of pistil of disk floret, peripheral pistillate floret, achene, inner involucre bract; outer involucre bract, lower cauline leaf, middle cauline leaf, upper cauline leaf.

3.0–3.5(4.0) mm long, usually upright, remote or approximate or branches in broadly pyramidal panicle. Involucre imbricate, densely whitish-pubescent; involucre bracts with scarious margin, outer small, oval, inner much larger, elliptical or oblanceolate. Florets 5–6 pink.

Plains as well as foothills and montane regions along river valleys, on saline clayey soils, sometimes on sands, gravelly or rubbly-clayey deposits.—*Soviet Central Asia*: Kyzyl-Kum, Amu-Darya, Syr-Darya, Tien Shan, Pamiro-Alai. Endemic. Described from Dzhalalabad District. Type in Leningrad.

Economic Importance. As reported by Agababayan, Kasimenko, and Granitov (1934), it is the main pasture fodder for sheep and camels in fall and winter but poor fodder for other types of stock.

According to the data of M.I. Goryaev, G.K. Kruglykhina, and E.I. Satdarova (1959), the plant contains alkaloids.

149. *A. porrecta* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 410; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 18, 27; Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, ser. 1, No. 4, 284, No. 201, nomen.

608 Perennial. Plant grayish to grayish-glaucous-green from dense pubescence in early vegetative period, later glabrescent. Tap root thick, woody, with short, perennial woody shoots covered with brown cracking bark. Flowering shoots very numerous, 45–60(70) cm high and up to 2–4(5) cm thick, strong, erect or basally ascending, arachnoid-hairy, later partly subglabrous, stramineous, branched above, with long, up to 7–15 cm long, obliquely upright, straight branches. Lower cauline leaves withering early, long-petiolate, up to 5 cm long, lamina oval-oblong, twice or thrice pinnately cut, terminal lobes flat, linear, 3–5(7) mm long, scarcely pointed, with prominent midrib; middle cauline leaves usually sessile, with pinnate auricles, their laminae once or twice pinnately cut, terminal lobes linear, 5–10(15) mm long, uppermost leaves undivided, linear, usually 2–3 mm long. Inflorescence broadly pyramidal panicle; capitula sessile, ovoid, 3–4 mm long, approximate, less often somewhat remote. Involucre imbricate; involucre bracts convex, punctate-glandular and whitish-pubescent, with scarious margin; outer bracts small, oval, inner considerably longer, oblanceolate, apically roundish. Florets 4–5, pink or yellow.

Note. The species is similar to *A. ferganensis* Krasch., distinguished by the narrower, always simple, lobes of the lower cauline leaves.

Economic Importance. According to the data of M.I. Goryaev, I.M. Shabanov, and L.A. Ignatova (1953), the essential oil contains: 36.9% levorotatory camphor and 47% cineole. Moreover, the oil also contains 6.9% free terpenic alcohols and 8.17% bound alcohols as

esters. The alcohol is mostly borneol, which is free form and also as an ester with a predominance of bornyl-isovalerate. Among acids only isovaleric acid was identified. Phenols were present in the oil in small quantity, and their nature has not been studied yet. The oil also contains sesquiterpenic compounds, partly carbonyl, in which, based on the recovery of 2,4-dinitro-phenylhydrazones, we may presume the presence of α -ciperone and tetrahydro- α -ciperone. The presence of α -thujone was confirmed from the constants of the fractions of the above-mentioned compounds.

According to the data of M.I. Goryaev and R.N. Sazonova (1959), the yield of essential oil is 1.5%; the oil contains aldehydes, ketones, camphor, azulene-forming sesquiterpenes, and sometimes also phenols. Alkaloids are also present.

150. *A. serotina* Bge. in Mém. Acad. Sc. Pétersb. VII (1854) 341; Boiss. Fl. or. III, 367; Fedtsch. Perech. Rast. Turk. IV, 195.—Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 21, 27, 94, 119.—*A. maracandica* Bge. in Mém. Acad. Sc. Pétersb. VII (1854) 345.—*A. fragrans* var. γ . *maracandica* Boiss. Fl. or. III (1875) 366; Fedtsch. op. cit. 195.—*A. fragrans* Bornm. in Sintenis, exs. No. 1999.

609 Perennial. Plant 35–65 cm high, grayish in early vegetative phase from dense arachnoid hairs, later weakly hairy or almost glabrous. Tap root woody, with short, perennial, woody shoots and annual, rather short, non-flowering shoots with rosette of leaves of early summer growth. Flowering shoots few, erect, hairy, later subglabrous, smooth, stramineous, branched above, with obliquely upright, arcuate or straight, most often up to 8–12 cm long branches. Lower leaves long petiolate, withering early, mostly 3–5 cm long, with pinnatisect auricles; their laminas oblong to broadly oval, twice pinnately cut, terminal lobes linear, 2–4 mm long, short-acuminate; middle cauline leaves short-petiolate or sessile, once or twice pinnate; upper leaves undivided, linear. Capitula sessile or pedunculate, ovate, up to 3 mm long, loosely spicate on branches in rather wide pyramidal panicle. Involucral bracts with scarious border; outer bracts small, oval, sub-acuminate, densely pubescent; inner larger, oblong oval, subglabrous. Florets 5–7; corolla yellow or red; filaments of stamen as long or somewhat shorter than anthers; style at maturity of ovary slightly exserted from corolla tube; stigma lobes long, recurved, with tuft of erect cilia at apex. Flowering August.

Clayey steppe slopes of foothills, loessial ridges, as also on terraces of river valleys and dry ravines. Weed of non-irrigated, abandoned, arable lands and pastures. — *Soviet Central Asia*: Kyzyl-Kum, Aralo-Caspian Region (southeastern part), Lake Balkhash Region (southern part), Syr-Darya. Endemic. Described from Uzbekistan. Type in Paris.

Note. Var. *maracandica* Bge., distinguished by longer, usually up to 15–18 cm-long, often almost horizontal branches, and 3–4 mm-long (and not 3 mm) capitula, should be recognized.

According to the studies of E.I. Satdarova, the essential oil of *A. serotina* Bge. contains the following components: 1) carbonyl compounds—a) α -thujone—53.9% by oil weight, b) carvone—5.73% by oil weight; c) camphor—2% by oil weight; d) unidentified carbonyl compounds—2.4%; 2) alcohols (thujyl alcohol—23.2%); 3) terpenic oxides (1.8=cineole=6.6% by oil weight); sesquiterpenic compounds similar to aremadendrone; its dehydrogenation produced azulene; 5) phenols (allylpyrocatechin was found in traces); 6) acids (isobutyric acid). According to the data of M.I. Goryaev, A.T. Petushkova, and N.A. Sviridova samples of *A. serotina* Bge. contain approximately 0.1–0.5% alkaloids, as was reported for the first time by P.S. Massagetov. Carotene content in the plant varies significantly: in drought years from 4.5 to 62.2 mg/kg and in wet years from 10.2 to 62.5 mg/kg; its minimum content being in the early spring, fall, and in the driest part of summer, while the maximum level shows two peaks: in April-May and August-September (Karmanovskaya, Berlyaeva, and Ryabina, 1951). The nutritive value of this wormwood, according to the above authors, is very high: 100 kg of absolute dry fodder contains 8.0–14.1 kg digestible protein and 57.6–106.6 fodder units. Despite high indices, the animals either do not eat this plant at all or very reluctantly. According to P.P. Poljakov's observations, this species is a rather persistent pasture weed, widely distributed in southern Kazakhstan and to some extent in the northern parts of Uzbekistan.

According to the data of M.I. Goryaev, G.I. Kryglykhina, and E.I. Satdarova (1959), var. *maracandica* Bge. contains alkaloids.

151. *A. valida* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 398; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 29.

Perennial. Root woody, thick, with rather numerous, ascending, perennial, woody, short, nonflowering shoots forming small tussocks. Flowering shoots numerous, less often few, strong, virgate, erect, sometimes basally ascending, 20–35 cm high, whitish, arachnoid-hairy when young, but partly glabrescent in fall, branched above, with somewhat divergent branches. Lower leaves withering early; petiolate, usually 2–4 mm long, lamina oval, twice pinnately cut, terminal lobes 1.5–3.0 mm long, somewhat succulent, linear; middle cauline leaves less compound, sessile; bracteal leaves small, linear or lanceolate. Capitula sessile or pedunculate, up to 3 mm long, spicately crowded

on branches in relatively narrow, dense, paniculate inflorescence. Involucre imbricate, whitish, densely pubescent; inner involucre bracts larger, outer bracts oval-oblong or oval, with broad, scarious border. Florets 3–5 corolla yellow. Flowering August.

Depressions, dry flat[beds of] ravines, clayey desert-like, salt marshes; quite abundant.—*Soviet Central Asia*: Syr-Darya. Endemic. Described from southern Kazakhstan, in vicinity of the village of Kobulsai. Type in Leningrad.

Economic Importance. According to the date of M.I. Goryaev and R.N. Sazonova (1959) the plant contains 0.5% essential oil; a little cineole and a large quantity of phenols were found in the oil. Phenols crystalize from the oil during steam distillation. Based on the analytical results, the phenol is tentatively related to the fluoracetophenon-dimentyl ester with the chemical formula $C_{10}H_{12}O_4$. It is interesting to note that the quantity of phenols in the oil increases as the plant becomes older.

152. **A. gypsacea** Krasch., M. Pop. and Lincz. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 409.

Perennial, semishrub 60–80 cm high, with perennial woody, long, erect, up to 6–8 mm thick nonflowering shoots covered with brownish-gray cracking bark. Flowering shoots few, straight, erect, 45–65 cm high, grayish, arachnoid-hairy, later almost glabrous, particularly in lower part, stramineous, branched, with short (2–6 cm long) or long, up to 12 cm, weakly divergent branches. Lower leaves long-petiolate, 5–8 cm long, densely hairy, later subglabrous, oblong, twice pinnately cut, terminal lobes linear, 7–12 mm long and 1 mm wide, with prominent veins, scarcely acuminate; middle cauline leaves sessile, with pinnate auricles; upper leaves undivided, linear, often with 2 short lobes at base. Capitula sessile or pedunculate, ovoid, up to 4 mm long, upright, remote, 2–3, only at apices of branches, in narrow panicle. Involucral bracts light brownish, with wide scarious border; outer bracts small, oval, scarcely acuminate, weakly pubescent, inner larger, oblong, glabrous. Florets 4–5, corolla up to 3 mm long; anthers at maturity scarcely exerted from corolla tube or as long as tube; stigma lobes one-fourth as long as style, with tuft of erect cilia at apex.

Southern clayey slopes, sometimes on white clay out-crops.—*Soviet Central Asia*: Mountainous Turkmenia. *General distribution*: Northern Iran. Described from the Chul. Type in Leningrad.

According to the data of Vyshensky, 0.5–0.7% essential oil containing camphor was obtained from the plant up to flowering time. I.A. Linczevsky (1935) relates this species to fodder plants in Kopetdag.

153. **A. namanganica** Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 275; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 119.—*A. uzbekistanica* Poljak. op. cit. 277.

Perennial, grayish arachnoid-hairy, later subglabrous. Root vertical, woody with short, perennial, woody, nonflowering ascending shoots forming small tussock. Flowering shoots very numerous, 35–60 cm high, straight or weakly curved, virgate, strongly branched, long, more or less divergent. Leaves of vegetative shoots and lower cauline leaves petiolate, 1.5–2.5 cm long and 0.7–1.0 cm wide, twice pinnately cut, terminal lobes 1.5–4.0 mm long, linear, subacuminate or round; middle cauline leaves sessile, once or twice pinnately cut, with pinnate auricles; upper cauline leaves smaller, simple pinnate, uppermost leaves undivided, linear, obtuse, sometimes with a pair of lateral lobes at base. Inflorescence pyramidal panicle; capitula sessile, ovoid, 3–4 mm long, upright, approximate or somewhat remote. Involucral bracts convex, with wide scarious border; outer bracts oval, herbaceous, arachnoid-hairy, inner larger, elliptical or oblanceolate, more or less glabrous. Florets 7–8; corolla yellow. Flowering August.

Rubby-clayey desert, sometimes on rubby-gravel deposits.—*Soviet Central Asia*: Syr-Darya (Fergana valley). Endemic. Described from Namangan District. Type in Leningrad.

612 **Note.** Var. *usbekistanica* Poljak. should be recognized; it is distinguished by smaller capitula (2–3 mm and not 3–4 mm long) with fewer florets (florets usually 3–7 and not 7 or 8); vicinity of Namangan Town.

Economic Importance. According to the data of M.I. Goryaev, G.K. Kruglykhina, and E.I. Satdarova (1959) it contains alkaloids.

Series 8. Turanica Poljak.—Involucral bracts usually many-whorled, imbricate, convex; flowering shoots whitish-hairy, later subglabrous, brown or blackish-brown, smooth; cauline leaves withering relatively early.

154. **A. turnica** Krasch. in Otch. o Rab. Pochv. Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 270.—*A. pallida* Poljak. and Krasch. in Byull. Gl. Bot. Sada Akad. Nauk SSSR, 6 (1950) 66.—*A. eremophila* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 401.—*A. diffusa* Krasch. ex Poljak. ibid., 400; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 119.

Perennial. Tap root thick, woody, in old specimens vertical split into several parts, with very numerous, prostrate or ascending, strongly condensed, perennial, woody, nonflowering shoots covered with grayish cracking bark. Flowering shoots numerous, slender, 20–40 cm high,

whitish arachnoid-hairy, later completely glabrous, intensely violet-brown or almost black, lustrous, branched above with almost horizontal branches (cf. the note). Leaves withering early, green; lower leaves petiolate, up to 1.5–2.0 cm long, their laminas oval, twice or thrice pinnately cut, terminal lobes linear, 3–5 mm long; middle cauline leaves sessile, less compound, with pinnate auricles; uppermost leaves undivided, linear, sometimes with 2 lateral lobes at base. Capitula sessile, remote, ovate or oblong, small, 2 mm long, in broad lax panicle. Involucral bracts 5–7-rowed, imbricate, grayish-tomentose, later subglabrous; outer bracts small, fleshy, oval, convex, humped, inner larger, oblong or oblong-linear, with wide scarious, lustrous border. Florets 3–5, corolla yellow; anthers linear, apical appendages subulate, basal appendages much short, round; stigma lobes short, linear-oblong, truncate, short-ciliate, after anthesis weakly divergent. Flowering September.

Clayey-rubby desert soils, along edges of sands, sandy gravelly alluvium, loams, as well as on outcrops of sandstones, limestones and conglomerates.—*Soviet Central Asia*: Kara-Kum, Kyzyl-Kum, Aralo-
 613 Caspian Region (southeastern part), Lake Balkhash Region (Betpak-Dala, Muyun-Kums), Syr-Darya, Amu-Darya, Pamiro-Alai (southeastern part). Endemic. Described from central Kazakhstan. Type in Leningrad.

Note. The following varieties should be recognized:

1) Var. *pallida* Poljak. ex Krasch.—distinguished by slender stems that are initially densely hairy, later almost glabrous, brownish, branched, with upwardly directed branches; found in Tien Shan (foothill plain of Syr-Darya part of Karatau).

2) Var. *diffusa* Krasch. ex Poljak.—With strong branched stems that are up to 3 mm thick at base, with leaves grayish-tomentose almost up to the end of vegetative growth or partly glabrescent, brownish or violet-brown in fall; found in Kyzyl-Kum and Kara-Kum.

3) Var. *eremophila* Poljak.—distinguished by few, comparatively low (15–25 cm high), weakly branched stems, with arcuate or almost horizontal branches; fewer capitula that are remote on branches; occasional in the foothill plain near Turkestan Range.

Economic Importance. According to the data of Z.M. Manulkin, the yield of essential oil is 0.69% (0.34% by weight of the whole plant). The oil has a characteristic camphor smell; the test for aldehydes and ketones is negative.

According to the data of Nechaeva (1949), var. *diffusa* has a strongly branched (70–80 cm thick[sic.]*) tap root in the upper 30–40 cm of the soil; besides, the major part of the roots and rootlets is

*Presumably 'long' intended—General Editor.

concentrated in the upper 20 cm of the soil. Because of the shallow root system the plant suffers greatly from summer drought.

The chemical composition of var. *diffusa* was studied by Pelt, Amelin, Morozova, and Morozov. They found in this variety a rather large quantity of ash, varying from 6.3 to 10.9%, depending on the stage of vegetative growth; fat—2.9–7.3%; cellulose—33.0–46.8%; nitrogen-free extractible substances—37.5–43.1%. Traces of alkaloids were found in the young shoots and capitula (Lazurevsky, 1937). According to the observations of Borovsky, Zinovev and others, it is a good fall-winter fattening fodder for sheep, camels, and, to some extent, horses; similarly it is relished in early spring. According to the data of I.V. Larin, the highest nutritive value of var. *diffusa* is found in spring (May) and is comparatively lower in late fall. According to the studies of M.I. Goryaev and R.N. Sazonova (1959), the plant contains 3.826% santonin; the yield of essential oil is 1.1%; the oil contains aldehydes, phenols, ketones, cineole, and azulene-forming sesquiterpenes.

According to the data of M.I. Goryaev, the yield of essential oil in var. *pallida* Poljak. is 1.82% on the basis of absolute dry weight; the test for phenols produces a weak, brownish-green color; the oil has a camphorous smell.

- 614 155. **A. kemrudica** Krasch. in Otch. o Rab. Pochv. Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR, IV, 2 (1930) 270.—*A. herba-alba* Asso ssp. *kemrudica* Krasch. in herb.—**Ис.:** Krascheninn. op. cit., Plate 1, II.

Perennial. Whole plant white when young, later grayish-greenish from arachnoid hairs. Root thick, vertical, woody, in older specimens often vertically split into several parts, with short, perennial, ascending or erect, woody, nonflowering shoots, forming rather compact, large tussock; short annual shoots with rosette of leaves in early summer; flowering shoots numerous, very slender, straight or weakly flexuous, 12–25 cm high, branched above, with upwardly directed, sometimes drooping or horizontal, usually 2–5 cm long branches. Leaves of nonflowering shoots and lower cauline leaves withering in summer, petiolate, 8–15 mm long, lamina oblong-lanceolate, once or twice pinnately cut, lobes divided into 2–3 linear secondary lobes, or simply linear; middle cauline leaves sessile, much shorter, pinnately cut; uppermost leaves undivided, linear. Capitula pedunculate, more or less divergent, sometimes drooping, ovoid or ovoid-conical, that is, shortly narrowed toward base, 3.0–4.5 mm long and 1.5–2.0 mm in dia, approximate or remote, in comparatively narrow paniculate inflorescence. Involucral bracts punctate-glandular, outer small, oval,

dorsally humped-convex, hairy; inner much larger, oblong, brownish, subglabrous, with scarious margin. Florets 2–3. Achenes somewhat flat, ovate, brown, up to 1.5 mm long and 0.7 mm wide.

Soviet Central Asia: Aralo-Caspian Region (Mangyshlak Peninsula, western Ust-Urt), Kara-Kum (northern part). Endemic. Described from eastern coast of Caspian Sea. Type in Leningrad.

Note. Var. *karabugasica* Krasch. (*Otch. o Rab. Pochv. Bot. Otr. Kazakhsk. Eksp. Akad. Nauk SSSR*, IV, 2 (1930) 270) differs from the typical form by having short stems (5–8 cm high), dense white-arachnoid pubescence, small simple pinnate leaves 2–4 mm long, and small sessile capitula. It is found on the eastern coast of the Caspian Sea, near Karabugaz Gulf.

156. *A. scotina* Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 4 (1937) 284.—*A. albicaulis* Nevski, *ibid.*, No. 200.

Perennial. Plant 30–35(40) cm high, grayish below in early vegetative phase, densely hairy, later partly glabrescent. Root vertical, woody, very thick, with short, perennial, ascending, less often prostrate, woody, nonflowering shoots forming tussock. Fertile shoots numerous, 20–30 cm high, straight or weakly flexuous, basally often arcuate, 615 branched above, with long, less often short, upwardly directed branches. Leaves grayish-green, lower cauline leaves and those of nonflowering shoots petiolate, their laminae oval, 1–2 cm long, twice pinnately cut; lobes pinnate, with 1–2 pairs of terminal linear-spatulate or linear lobes 3–6 mm long; middle cauline leaves sessile, less divided, with linear, sessile auricles at base; upper leaves undivided, linear-oblong, subacuminate. Capitula usually sessile, ovate, 3–4 mm long, remote or approximate in more or less oblong panicle. Involucre many-rowed, imbricate; involucre bracts punctate-glandular; outer bracts small, oval, densely hairy; inner larger, oval-elliptical or more or less lanceolate, hairy in upper part, elsewhere glabrous, light-green, with wide, scarious margin. Florets 5–6; corolla yellow; stigma lobes short, more or less divergent, apically with tuft of upright cilia. Flowering September.

Rubly and stony slopes of lower mountains.—*Soviet Central Asia*: Pamiro-Alai Region. Endemic. Described from Kugitang Range. Type in Leningrad.

157. *A. kochiiformis* Krasch. and Lincz. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 411–412.

Perennial. Plant 35–60(70) cm high, whitish from dense arachnoid-hairs, partly glabrescent by end of vegetative growth. Tap root, woody, with brown, short, ascending, perennial, woolly, nonflowering shoots forming tussock. Flowering shoots 12–20 and more, straight, robust,

whitish-tomentose, later sub-glabrous, stramineous-brown, smooth, branched above, with upwardly directed branches, up to 12 cm long. Leaves of vegetative shoots and lower cauline leaves long-petiolate, 4–7 cm long, their laminas oblong, twice or thrice pinnately cut, terminal lobes narrowly linear, 7–12(20) mm long and 0.3 mm wide, short-acuminate; middle cauline leaves sub-sessile, once or twice pinnately cut, with pinnate or undivided linear auricles at base; uppermost leaves undivided, linear. Capitula sessile, upright, oblong-ovoid, narrowed toward base, cuneate, 3–4 mm long, in oblong paniculate inflorescence. Involucre many-rowed, imbricate; outer bracts small, oval, convex, inner larger, oblong, with wide, scarious margin. Florets 5; corolla yellow; anthers linear, apical appendages of anthers subulate, basal appendages short, subacuminate, style shorter than stamens; stigma lobes linear, exserted, short-ciliate. Achenes plano-convex, ovoid, up to 1 mm long and 0.5 mm wide.

Clayey, sometimes on rubbly slopes of mountains, river terraces above floodplain and gypsiferous outcrops.—*Soviet Central Asia*: 616 Pamiro-Alai Region. Endemic. Described from southern Tadzhikistan (Karatau Range). Type in Leningrad.

158. *A. sogdiana* Bge. in Mém. Acad. Sc. Pétersb. VII (1854) 343; Boiss. Fl. or. III, 367; Fedtsch. Perech. Rast. Turk. III, 195.

Perennial. Plant grayish from dense arachnoid hairs, partly glabrous at anthesis. Root thick, woody, vertical, with woody, strongly shortened, ascending, nonflowering shoots covered with light brown peeling bark, annual shoots bearing rosettes of early summer leaves; flowering shoots 30–35 cm high, numerous, slender, erect, virgate, branched slightly above base, with somewhat divergent branches, mostly 1 to 3 cm long. Leaves of vegetative shoots and lower cauline leaves short-petiolate, up to 1.0–1.5 cm long, their laminas oblong, twice pinnately cut, terminal lobes oblong-linear, subobtuse; higher leaves usually sessile, pinnate, with 2 pairs of lateral lobes; uppermost leaves undivided, oblong-linear, with short oblong lobes at base. Capitula pedunculate, oblong-ovoid or narrowly campanulate, up to 3 mm long, spicately aggregated, less often solitary and remote in narrowly branched inflorescence. Involucral bracts with scarious border, outer bracts small, oval, inner long, linear-oblong. Florets 3; corolla pink; anthers linear, apical appendages of anthers narrowly linear, almost subulate, basal appendages shorter, subacuminate; style shorter than stamens; stigma lobes narrowly linear, truncate, short-ciliate, after anthesis divergent.

Gravelly-clayey deposits in desert zone.—*Soviet Central Asia*: Syrdarya. Endemic. Described from Zerav-shan. Type in Leningrad.

Note. The report by B.A. Fedtschenko (*Perech. Rast. Turk.*, IV (1911) 196) on the occurrence of *Artemisia oliveriana* Gay ex Bess. in the Tien Shan and the Samarkand Region is not confirmed by herbarium material. This species, described from northern Iran, has cylindrical capitula in spicate-paniculate inflorescences with few, purple florets and shiny involucre bracts. On this basis one can say that it probably is close to *A. sogdiana* Bge.

159. ***A. stenocephala*** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 404.

Perennial. Root woody, vertical. Flowering shoots few or solitary, at base woody, erect, 40–80 cm high, arachnoid-hairy, later subglabrous, light brown, branched slightly above base, with numerous, obliquely upright, rather long, slender, virgate, straight, flowering branches. Lower leaves withering early, petiolate, about 1 cm long, twice pinnately cut, 617 their terminal lobes linear, 2–3 mm long, subobtus; upper leaves sessile, undivided, linear, mostly 1.5–3.0 mm long, obtuse, round. Capitula in dense, more or less broad, paniculate inflorescence, sessile, narrowly oblong, 3–4 mm long and up to 1.5 mm in dia, somewhat remote or almost spicately aggregated. Involucre bracts many-rowed, with scarious border; outer bracts oval, convex, grayish-green, pubescent, inner long, oblong-lanceolate, subglabrous. Florets 5–6 corolla purple-pink; anthers linear, apical appendages of anthers narrowly angular, round, basal appendages acute; stigma lobes linear, exerted. Flowering September.

Gravel streambeds.—*Soviet Central Asia*: mountainous Turkmenia (Kopetdag). *General distribution*: Afghanistan. Described from Bukinich's collections from Afghanistan (between Ghazni and Kelat[Kalat, Khelat]). Type in Leningrad.

160. ***A. kopetdaghensis*** Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 406.

Perennial. Plant 35–45 cm high, whitish, later grayish-greenish from arachnoid hairs. Root vertical woody, thick, with short perennial, upright, woody, nonflowering shoots covered with brownish-gray peeling bark.

Flowering shoots numerous, 25–40 cm high, 1.0–1.5 mm thick, usually erect, virgate, branched in upper third, with upwardly directed branches, mostly up to 4–7 cm long. Leaves on most part of stem withering, early, with pinnately cut auricles; lower leaves petiolate, 1.5–2.0 cm long, their laminae oval, twice pinnately cut, terminal lobes narrowly linear, 4–6 mm long, subacuminate, middle cauline leaves subsessile, less compound, upper sessile, undivided, linear, with 2

lateral, narrow lobes at base. Capitula sessile, upright, 3.0–3.5 mm long, somewhat remote or loosely spicate on branches, in oblong, paniculate inflorescence. Involucre many-rowed, imbricate; involucre bracts white-pubescent, punctate-glandular, oval, with scarious border, outer bracts shorter than inner. Florets 4–5.

Clayey or rubbly clayey slopes of hills.—*Soviet Central Asia*: mountainous Turkmenia. Described from Kara-kala District. Type in Leningrad.

According to the studies of V.I. Nilov and N.P. Kiryalov, the yield of essential oil varies according to the stage of vegetative growth from 0.2 to 1.2%. After analysis of the fractions the presence of α -pinene—2.2%, cineole—35–40%, and ketones—47–79% was determined; camphor and mainly α -thujone, as well as a small quantity of aldehydes and a similar unstudied phenol, were found among them.

161. **A. balchanorum** Krasch. in Spisok Rast. Gerb. Fl. SSSR, X (1936) 104, 105; Bobrov in Tr. Bot. Sada Akad. Nauk SSSR, XLIV, 27, 75.—**Exs.**: GRF No. 3197.

- 618 Perennial semishrub, 40–50 cm high, pleasantly fragrant. Root woody, with short, ascending, perennial, woody, nonflowering shoots covered with gray bark. Flowering shoots hairy, later subglabrous, light brown, branched above, with weakly divergent branches. Leaves grayish, later green, densely punctate-glandular, lower cauline leaves withering early, petiolate, 1–3 cm long, lamina oblong, twice or thrice pinnately cut, terminal lobes somewhat thick, remote, linear, 3–5 mm long; middle cauline leaves sessile, less divided; uppermost leaves linear. Capitula sessile, upright, ovate, 3–4 mm long, remote or 2–3, in long, compact panicle. Involucre many-rowed, imbricate; involucre bracts hairy and densely punctate-glandular, outer bracts small, round, carinate, inner large, oblong-oval, green, with broadly scarious border. Florets 4–5; corolla yellow, punctate-glandular.

Clayey and stony slopes, foothill plains, limestone outcrops.—*Soviet Central Asia*: mountainous Turkmenia (Greater Balkan Mountains). Described from Greater Balkans. Type in Leningrad.

According to the data of R.Ya. Ratanova, the essential oil of wild *A. balchanorum* Krasch. contains about 16% citral, about 35% geraniol, 35–40% levorotatory, linalool [coriandrol], about 0.5% cresols, about 1% valeric and butyric acids. Cultivated specimens of this species contained: 5% citral, 40–50% linalool, 25–30% geraniol, about 0.5% cresols, and acids (probably butyric and valeric) in insignificant quantity.

The plant is cultivated for its essential oil.

162. **A. turcomanica** Gndg. in Bull. Soc. Bot. de France, XVIII (1918) 38.—**Exs.:** Sintenis, It. transcasp. pers. 1900–1901, No. 1035.

Perennial semishrub, 30–50(60) cm high. Tap root woody, with short perennial, woody, erect or ascending, nonflowering shoots covered with brownish-gray bark. Flowering shoots very numerous, 25–40(45) cm high, erect or at base arcuate, strong, virgate, in early vegetative growth phase grayish-tomentose, later partly glabrous, light brown, branched above, with more or less short, somewhat divergent branches. Leaves whitish-tomentose, later grayish-green, punctate-glandular; lower cauline leaves and leaves of nonflowering shoots petiolate, usually 1.2–1.5 cm long, lamina oval or round, twice pinnately cut, terminal lobes linear, lobate, 1–2–3 mm long, somewhat thick, subacuminate, middle cauline leaves subsessile, less divided, with pinnate or simple, 619 linear auricles at base; uppermost leaves linear, sometimes with 2 lateral lobes at base. Capitula sessile, oblong, 3–5 mm long, loosely spicate or more or less remote in narrow pyramidal panicle. Involucre many-rowed, imbricate; outer involucral bracts small, oval, densely hairy, inner considerably larger, lanceolate-oblong, smooth, with wide scarious border. Florets usually 5; anthers with very long filaments, linear, apical appendages of anthers narrow, subulate, basal appendages much shorter, obtuse; style shorter than stamens; stigma lobes linear, sulcate, exserted, truncate, with ciliate margin.

Stony slopes of lower mountains—*Soviet Central Asia*: mountainous Turkmenia. Endemic. Type published.

163. **A. badhysi** Krasch. and Lincz. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 405.—**A. arenicola** Poljak. *ibid.* 408.

Perennial semishrub, 30–45(60) cm high. Tap root woody with short, erect or ascending, perennial, woody, nonflowering shoots covered with brownish bark. Flowering shoots numerous, 20–35(50) cm high, whitish-tomentose, later partly glabrous, light brown, strong, virgate, branched above, with long, erect or divergent branches. Leaves grayish-green, densely arachnoid-hairy; lower leaves withering early, long-petiolate, 1–2–3 cm long, lamina round or broadly round, twice pinnately cut, terminal lobes linear, 2–5 mm long, subacuminate or with round apex, middle cauline leaves short-petiolate, less compound with pinnate auricles; upper leaves sessile, pinnate or broadly linear, usually with 2 lateral lobes at base. Capitula sessile or pedunculate, 2–3 mm long, ovate, remote or 2–5 on branches, or crowded in narrow spicate-paniculate inflorescence. Involucral bracts oval, densely hairy and punctate-glandular, with scarious border, outer shorter than inner ones.

Stony mountain slopes.—*Soviet Central Asia*: mountainous Turkmenia, Kara-Kum (southeast). Endemic. Described from Gyaz-Gyadyk (Badkhyz) Range. Type in Leningrad.

Note 1. Var. *arenicola* Poljak should be recognized. It is distinguished by more or less long, usually almost horizontal branches and ovoid-oblong, somewhat larger capitula (3.5–4.0 mm long). Kara-Kum.

Note 2. According to the observations of E.A. Mokeeva and E.I. Rachkovskaya, the main mass of the roots of *A. badhysi* is concentrated at a depth of 24 cm (84%); ephemeral rootlets develop on the upper part of the root using the spring moisture and dying out toward
620 the dry summer period. The superficial root system enables the plant to use only rainfalls, thereby making it mostly dependent on precipitation. The vegetative growth of *A. badhysi* begins in March; rapid shoot growth commences in April, and the capitula develop in May. However, in the opinion of the authors, this development is limited to the formation of the involucre and only in the summer do rudiments of florets develop slowly, while in the fall the plant flowers and bears fruits.

In M.I. Goryaev's work: (*Materially po Khimii Efirnogo Masla* [Data on the Chemistry of Essential Oils], Alma Ata, 1952), chemical data pertaining to [the oil of] *A. balchanorum*, are erroneously attributed to *A. badhysi*.

Economic Importance. According to I.V. Larin, the edibility of this wormwood for sheep varies with the season of the year as well as from year to year, depending on the quality of the pastures. When there is good growth of the ephemeral vegetation in the spring and summer, it is not eaten much, but in bad years it is eaten readily.

164. *A. prasina* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 413.

Perennial semishrub. Root vertical, woody, thick, with short, perennial, woody, nonflowering shoots. Flowering shoots rather numerous, sometimes fewer, erect, 20–30 cm high, whitish-tomentose, later subglabrous, dark brown, branched above, with short or long, upwardly directed branches. Leaves grayish, densely hairy; lower cauline leaves and leaves of vegetative shoots petiolate, 1.5–2.0(2.5) cm long; lamina oval or round, twice pinnately cut, terminal lobes 2–4 mm long, linear, subobtuse, middle leaves sessile or short-petiolate, pinnately cut, with palmate or pinnate auricles at base; upper leaves small, linear, sometimes with 2 lateral lobes at base. Panicle narrowly pyramidal; capitula sessile, ovoid, 3–4 mm long, upright, approximate or somewhat remote. Involucral bracts oval, convex, bright, dark bluish-

green, pubescent and punctate-glandular, inner bracts somewhat longer than outer with scarious border. Florets 5; anthers with shorter filaments, linear, apical appendages of anthers acute, almost subulate, basal appendages much shorter, sub-obtuse; stigma lobes short, linear, weakly sulcate, thickened along edges, apically truncate, with erect cilia.

Clayey slopes of foothills.—*Soviet Central Asia*: Western Pamiro-Alai Region. Endemic.

Note. A doubtful species, very similar to *A. badhysi* Krasch. Additional material is necessary to resolve finally the question of its separate status.

165. *A. spicigera* C. Koch in Linnaea, XXIV (1851) 345; Grossh. Fl. Kavk. IV, 142.—*A. araxina* Takht. in Tr. Armyansk. Fil. Akad. 621 Nauk SSSR, Ser. Biol. II (1937) 209.—*A. issaevi* Rzazade in Izv. Akad. Nauk AzSSR, 3 (1955) 23.

Perennial. Plant 25–35 cm high, grayish in early vegetative growth phase, densely pubescent, later sub-glabrous. Tap root, thick, woody, short, perennial, woody, ascending, nonflowering shoots together with young, leafy shoots forming low, rather compact tussock. Flowering shoots numerous, slender, up to 1 mm thick, stiff, mostly erect, subglabrous by end of vegetative growth, brown, branched above, with more or less short, weakly divergent branches. Lower cauline leaves petiolate, withering, early lamina oval, twice pinnately cut, terminal lobes linear, 2–4 mm long, subacuminate, middle cauline leaves short-petiolate or sessile, once or twice pinnate; uppermost leaves sessile, linear. Capitula sessile or pedunculate, upright, almost linear-cylindrical, 3–4 mm long, in narrow, compact, spicate-paniculate inflorescence. Involucral bracts tuberculate-glandular and densely whitish-pubescent, with scarious border, outer bracts small, ovate, inner larger, linear-oblong. Florets 4–5.

Dry stony slopes.—*Caucasus*: Southern Transcaucasia. *General distribution*: Eastern Anatolia. Described from the former Kars Region. Type in Berlin.

Note. *A. issaevi* Rzazade is a rather stunted form of *A. spicigera* C. Koch with undeveloped capitula.

166. *A. sieberi* Bess. in Bull. Soc. Nat. Mosc. IX (1836) 80.—*A. herba alba* var. *laxiflora* Boiss. Fl. or. III (1875) 365, p. min. p.—*A. herba alba* ssp. *saxicola* Krasch. in herb.—*A. dumosa* Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 425.

Perennial. Low semishrub 20–35 cm high. Root thick, woody, vertical with numerous, strongly branched, perennial, woody shoots. Flowering shoots erect, grayish-tomentose, virgate, stiff, 7–15 cm long,

repeatedly branched, with almost horizontal or upwardly directed terminal branches, forming rather compact, stiff, hemispherical crown. Leaves of nonflowering shoots petiolate, withering early, 0.9–1.5 cm long, oval, twice pinnately cut, lobes usually 2 on each side, terminal lobes linear, 1.5–3.0 mm long, subacute. Leaves of fertile branches smaller, subsessile, simple pinnate, with pinnate auricles at base; uppermost leaves very small, linear. Capitula sessile, ovoid, 3–4 mm long, remote or in clusters of few on terminal branches. Involucre manyrowed, imbricate; outer involucre bracts small, oval, convex, densely pubescent, inner much larger, oblong, subglabrous, with wide scarious border. Florets 3–4; corolla pink or yellow; anthers linear, apical appendages of anthers narrowly linear, almost subulate, basal
 622 appendages shorter, acuminate; style as long as stamens; stigma lobes linear, short-ciliate, divergent.

Stony mountain slopes.—*Soviet Central Asia*: mountainous Turkmenia (Kopetdag), Kara-Kum (southwest). *General distribution*: Northern Iran. Described from Krasnovodsk District. Type in Leningrad.

Note. The report by B.A. Fedtschenko (*Perech. Rast. Turk.*, IV (1911) 192) on the distribution of *Artemisia herba-alba* var. *laxiflora* Boiss. and var. *densiflora* Boiss. in the Chu, Sary-Su, Balkhash, and Khiya districts and the Trans-caucasian Region, in fact, pertains not to one taxon, but to a group of four: *A. herba-alba* Asso, *A. oliveriana* Bess., *A. sieberi* Bess., and *A. billardierana* Bess. Of these the last two were united by Boissier as one variety (*A. herba-alba* var. *laxiflora* Boiss.), while *A. oliveriana* Bess. was designated as var. *densiflora* (*Fl. or.* III, 365). *A. billardierana* Bess. (from the vicinity of Damascus) is very close to *A. herba-alba* Asso (from western Africa and Spain), and *A. oliveriana* Bess. (from northern Iran) apparently is similar to the Mediterranean *A. sogdiana* Bge. However, this question cannot be decided finally because of the lack of herbarium specimens. Thus, from the above-mentioned species, only *A. sieberi* Bess. is reliably found in the USSR.

Series 9. Lehmannianea Poljak.—Stems simple or branched above, with short, less often long branches; capitula remote or in compact spikes or racemose-spicate or racemose-paniculate, or even spicate inflorescence; lower cauline leaves twice, thrice or even four times pinnately cut.

167. ***A. lehmanniana*** Bge. in Mém. Acad. Sc. Pétersb. VII (1854) 340; Boiss. *Fl. or.* III, 368; Fedtsch. *Perech. Rast. Turk.* IV, 195.—*A. skorniakowi* Winkl. in Tr. Peterb. Bot. Sada, XI, 2 (1892) 331; O. Fedtsch. *Fl. Pam.* 116; Fedtsch. *Perech. Rast. Turk.* IV, 199; Poljak.

in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 26.—*A. korshinskyi* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 415.—*A. lehmanniana* ssp. *leucotricha* Krasch. nom. (in herb.).

Perennial semishrub, 20–45 cm high. Root thick, sometimes up to 2 cm thick, woody, vertical, with short, almost from base strongly branched, perennial, woody, ascending, nonflowering shoots covered with brownish bark. Flowering shoots numerous or few, 15–25(50) cm high, arachnoid-hairy, later subglabrous, strong, sulcate, straight or arcuate, simple or with short branches. Leaves grayish, densely pubescent, later subglabrous or with remnants of pubescence (f. *tomentosa* Krasch.); lower leaves long-petiolate, 2–3(5) cm long, with truncate auricles; lamina roundish or prolate, thrice pinnately cut; terminal lobes linear to linear-subulate; middle cauline leaves short-petiolate, apical leaves sessile, mostly pinnate. Capitula sessile, ovoid, 2.5–3.0 mm long, in groups of few in compact globose or ovoid spikes (heads), latter on short, remote branches, usually not exceeding spikes, forming narrowly spicate-paniculate inflorescence. Involucral bracts oval, glabrous, with wide, brown, scarious border, apically emarginate-toothed, dorsally punctate-glandular. Florets 7–8; corolla purple; stamens scarcely exerted. Receptacle small, smooth.

High-mountain rubbly and clayey-rubbly slopes.—*Soviet Central Asia*: Pamiro-Alai, Tien Shan. *General distribution*: Kashgaria. Described from Zeravshan Range (Karatau). Type in Leningrad.

Note. The following varieties should be recognized:

1) Var. *skorniakovii* Winkl.—distinguished by short stem, 12–30 cm high, grayish, arachnoid-hairs persisting up to the end of vegetative period, and short-petiolate, very closely borne leaves. Eastern Pamir, on rubbly slopes and moraines. This variety is usually confused with *A. rhodantha* Rupr., also found in the Pamir, although the latter is well distinguished, being an herbaceous perennial.

2) Var. *korshinskyi* Krasch. ex Poljak.—distinguished by branched stems with rather long upright branches.

Economic Importance. In the early stages of its vegetative growth, it is eaten readily by sheep and goats and is relished by yaks; in the summer it is not eaten by live-stock. According to the studies of Pekhachek (1948), 100 g of green mass contains 2 to 8 mg of vitamin C and 3.2–6.2 mg of vitamin A. Experiments on digestibility, conducted by Pekhachek (1944) at the Pamir Biological Station, have established that 100 kg of the herb contains 3.0 kg of digestible protein and 22.7 fodder units, corresponding to 7.5 and 56.8 respectively, when converted to absolute dry weight. Fodder with such a nutritive value, in Larin's opinion, is in no way inferior to the best hay from leguminous herbs. It must be noted that Pekhachek's data pertain not to var. *skorniakovii*

(C. Winkl.) Poljak., as considered by the author of the report, but probably to *A. rhodantha* Rupr., which is found in the vicinity of the Pamir Biological Station.

According to the data of M.I. Goryaev and R.N. Sazonova (1958), the plant contains 0.07% essential oil; the oil contains a small quantity of phenols, azulene-forming sesquiterpenes, and ketones.

168. *A. vachanica* Krasch. ex Poljak. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 413.

Perennial, glaucescent green plant, 25–30 cm high. Tap root thick, woody, with numerous perennial, strongly reduced, ascending, woody, nonflowering shoots forming tussock. Flowering shoots numerous, slender, more or less erect, sulcate, greenish, weakly pubescent or subglabrous, simple or with short, appressed branches in upper part. Leaves of nonflowering shoots and lower cauline leaves usually densely
624 grayish-lanate, short-petiolate, 1.0–1.5 cm long, twice pinnately cut, terminal lobes 1.0–1.5 mm long, oblong-linear, obtuse; middle cauline leaves sessile, weakly pubescent or subglabrous, apical leaves undivided, lanceolate, keeled, short-acuminate. Capitula in simple, sparse, spicate or racemose-spicate inflorescence, remote, solitary, less often 2–3, sessile, ovate, up to 2 mm long. Involucral bracts punctate-glandular; outer bracts small, oblong, more or less pubescent, inner larger, oval, glabrous or subglabrous, with wide scarious border. Florets 3–4; corolla purple-pink.

Stony mountain slopes and in high-altitude semi-desert zone.—*Soviet Central Asia*: Pamiro-Alai Region (mountainous Badakhshan). Endemic. Described from vicinity of Lyangar. Type in Leningrad.

169. *A. baldshuanica* Krasch. and Zapr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 3 (1936) 351.

Perennial semishrub, 80–100 cm high, with long, perennial, ascending or erect, woody, nonflowering shoots covered with gray cracking bark. Flowering shoots ascending or erect, branched in upper half, with long (up to 20–35 cm), strongly divergent branches. Leaves grayish from white tomentose, caducous hairs; leaves of nonflowering shoots and cauline leaves subsessile, 3.5–5.0 cm long and 1.5–3.0 cm wide, oval or oblong, thrice or four times pinnately cut, their terminal lobes linear, 2–4 mm long, scarcely acuminate. Capitula sessile, ovoid, mature capitula narrowly goblet-shaped, 3.0–2.5 mm long, 2–3 or more at apices of branches in spicate, rather broad, paniculate inflorescence. Involucral bracts convex, with scarious border; outer bracts small, round-oval, inner larger, oblong. Florets usually 5, with purple-red corolla; anthers on comparatively short filaments, apical appendages

of anthers narrow, subulate, basal appendages much shorter, subobtusate; style almost as long as stamens, its lobes short-linear, sulcate, erect, with thick margin, apically truncate, with short, upright cilia. Achenes small, 0.5 mm long, ovoid, somewhat flat, brownish.

Clayey and clayey-rubbly mountain slopes.—*Soviet Central Asia*: Pamiro-Alai Region. Endemic. Described from Lyangar District. Type in Leningrad.

According to the studies of I.P. Tsukervanik and L.S. Grach, the essential oil of *A. baldshuanica* Krasch. and Zapr. contains about 60% α - and β -thujone, 16% thujyl alcohol, a small quantity of isothujylvalerianate and aldehydes (semicarbazone, with melting point at 199–200°).

Series 10. Santolinae Poljak.—All leaves simple, linear or oblong-linear, short pinnately lobed; involuclral bracts withering before maturity of achenes.

- 625 170. *A. santolina* Schrenk in Bull. Phys. Math. Acad. Sc. Pétersb. III, 7 (1845) 106; Fedtsch. Perech. Rast. Turk. IV, 193.—*Exs.*: GRF No. 3198.

Perennial. Root rather thick, woody, vertical, with short, more or less erect, perennial, woody nonflowering shoots covered with brown peeling bark. Flowering shoots in large number, straight or flexuous, 25–35(45) cm high, whitish-hairy, branched above, with upwardly directed branches. Leaves of nonflowering shoots and lower cauline leaves short-petiolate, strongly variable in size, 1–7 cm long, oblong-linear, pinnately divided, lateral segments undivided, roundish or oblong or in turn even shallowly divided into 2–3 roundish lobes; sometimes leaves linear, entire (f. *simplicifolia* Poljak.) or broadly toothed; upper leaves sessile, small, linear. Capitula sessile or pedunculate, ovoid, up to 5 mm long, with 3–4 florets, remote in lax, oblong, paniculate inflorescence. Involuclral bracts withering before achenes maturity, outer bracts small, oval, grayish-pubescent, inner larger, oblong, scarious, glabrous, dorsally with narrow, brownish stripe. Flowering August.

Desert sands.—*Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Kara-Kum, Kyzyl-Kum. *General distribution*: Northern Iran, Kuldzha. Described from Ili River sands. Type in Leningrad.

171. *A. lobulifolia* Boiss. Flora Orientalis, III (1875) 364.

Perennial. Whole plant more or less grayish-tomentose; root rather thick, woody, vertical, with perennial, woody, nonflowering shoots covered with brownish-gray peeling bark, strongly reduced, erect.

Flowering shoots rather numerous, almost straight, erect, 25–35 cm high, branched almost from base, with more or less divergent branches. Lower and middle cauline leaves linear, shortly pinnately lobed, their lateral segments small, deltoid-oval or oval, short-decurrent on rachis, usually 7–9 on each side, simple or with 2–3-parted lobes; upper leaves small, undivided, scaly, broadly linear. Capitula sessile, oblong, up to 4 mm long, with 5–6 florets, remote or crowded in lax paniculate inflorescence. Involucral bracts densely hairy, outer bracts small, round or oval, convex, almost herbaceous, inner larger, linear-oblong, scarious.

Takys in depressions and limestones outcrops. — *Soviet Central Asia*: Kara-Kum. *General distribution*: Iran-Afghanistan (western Afghanistan). Described from western Afghanistan (between Herat and Tabas).

626 **Note.** This species is very similar to *A. santolina* Schrenk but differs from it by having hairy deltoid-oval or oval, lateral segments of the leaves that are very short-decurrent on the rachis.

Series 11. Tridentatae Poljak.—All leaves simple, linear, entire or with three to five apical teeth.

172. **A. deserti** Krasch. in Sched. ad Herb. Fl. URSS, X (1936) 106.—**Exs.:** GRF No. 3199a, b.

Perennial semishrub, 50–60 cm high. Root thick, woody, vertical, perennial, woody, branched, upward-spreading, nonflowering shoots covered with whitish-gray, peeling bark. Flowering shoots numerous, more or less grayish from hairs, later subglabrous, erect, relatively slender, virgate, branched above, with straight, distinctly divergent, slender branches. Leaves densely grayish-pubescent, undivided, linear, with narrowly carinate base, 1–2 cm long, 2–4 mm wide, apically with 3–5 obtuse, broadly linear teeth, 1.5 mm long; upper leaves entire, shorter and narrower. Inflorescence more or less broadly paniculate; capitula sessile or on short peduncles, upright, remote or approximate, 2–3, ovoid-oblong, 4–5 mm long. Involucre imbricate; outer involucral bracts small, oval, carinate, grayish-pubescent, inner larger, oblong or oblong-oval, smooth, with broadly scarious border, greenish on convex dorsal side. Florets 3–5; corolla purple; anthers linear, apical appendages of anthers narrowly linear, obtuse, basal appendages shorter, scarcely acuminate; style at achen maturity as long as stamens or somewhat longer, its lobes linear, short-ciliate, after flowering divergent. Achenes up to 2 mm long, ovoid, somewhat flat, brown.

Dry sandy-gravelly beds of mountain streams.—*Soviet Central Asia*: mountainous Turkmenia (Kyurendag). Endemic. Described from vicinity of Kazandzhik. Type and cotype published.

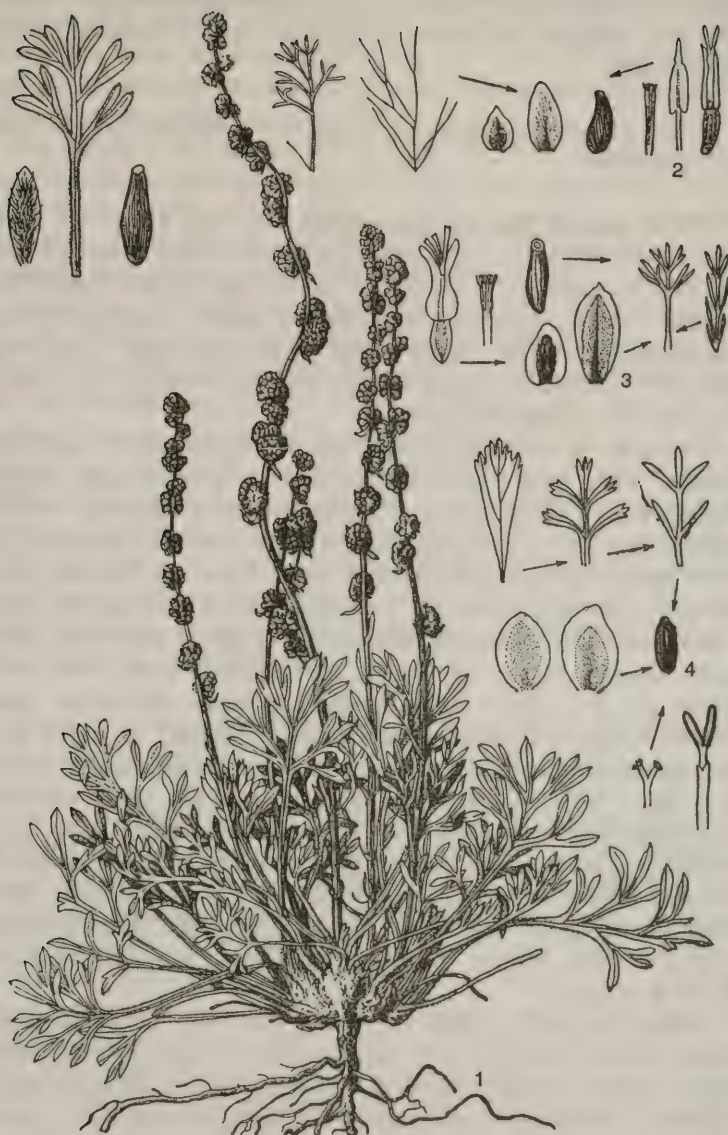


Plate XXX.

1 — *Turaniphytum eranthemum* (Bge.) Poljak., habit, lower and middle leaves, involucre bract, achene; 2 — *Artemisia capillaris* Thunb., leaf, involucre bract, achenes, peripheral pistillate floret, rudiment of pistil of disk floret, stamen; 3 — *A. saposhnikovii* Krasch. ex Poljak., leaf, involucre bract, peripheral pistillate floret, rudiment of pistil of disk floret, achene; 4 — *A. desertorum* Spreng., leaf, involucre bract, rudiment of pistil of disk floret, upper part of peripheral pistillate floret.

Section 2. *Junceum* Poljak.—Lower cauline leaves mostly 3-lobed; hairs bifid, straight, appressed or long and erect; receptacle small, hemispherical.

629 **Series 12. *Appressopilosae* Poljak.**—Perennials; hairs straight, bifid, appressed.

173. ***A. juncea* Kar. and Kir.** in Bull. Soc. Nat. Mosc. XV (1842) 383; Ldb. Fl. Ross. II, 2, 576; Fedtsch. Perech. Rast. Turk. IV, 195; Kryl. Fl. Zap. Sib. XI, 2788; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 21, 26, 96.—***A. multifida* Kar. and Kir.** nomen in herb.—***A. macrosciadia* Poljak.** in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 423; Poljak. op. cit. 93.—**Ice.**: Poljak. op. cit. 93.—**Exs.**: Gerb. Fl. SSSR, No. 3190.

Perennial. Whole plant grayish from dense, short, compactly appressed hairs. Root thick, woody, vertical, with strongly reduced, perennial, woody, nonflowering shoots covered with yellowish-brownish fibrously split bark. Flowering shoots straight, sulcate, numerous, 20–40 cm high, branched above, with short branches. Leaves except uppermost, petiolate, petioles as long as or shorter than lamina, lamina cut up to base into 3 lobes; middle and upper leaves undivided, linear, apically slightly wider, with obtuse cartilaginous apex; lower leaves divided into 2–3 linear lobes; uppermost leaves undivided, linear. Capitula sessile, lax, terminal on stems, in loosely arranged dense spikes on short branches, oblong-ovoid, 4.0–4.5 mm long and about 2 mm in dia or 5–6 mm long and up to 2.5 mm in dia. Outer involucre bracts broadly oval, grayish from compactly appressed hairs, 1/5 to 1/4 as long as inner bracts, later oblong-oval or oblong, almost smooth, with wide, light brownish, scarious border. Florets 4–7; corolla yellow; anthers linear, apical appendage of anthers subulate, basal appendage scarcely visible, round; stigma lobes linear, short, short-ciliate. Flowering August.

Rubby slopes of [mud] volcanic cones, also rarely on sandy-gravelly alluvial soils of river valleys.—**Soviet Central Asia:** Aralo-Caspian Region (Mugodzhary), Kyzyl-Kum, Lake Balkhash Region, Syr-Darya, Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai. **General distribution:** Dzhungaria-Kashgaria. Described from Ayaguz in Dzhungaria. Cotype in Leningrad.

Note. Var. *macrosciadia* Poljak. should be recognized. It is distinguished by its slightly shorter lower cauline leaves (up to 1.5–2.0 cm) and their 4–6 mm-long terminal lobe, as also by the larger (5–6 mm long) and densely pubescent capitula. It contains 0.76% santonin.

According to the data of Z.M. Manulkin *A. juncea* Kar. and Kir. contains 1.05% essential oil. Qualitative tests for aldehydes with fuchsin sulfurous acid, as well as for cineole with resorcin, were negative. Carbonyl compounds are present in the oil, but the reaction to camphor and borneol was negative.

630 According to the data of M.I. Goryaev and R.N. Sazonova (1959), the plants contain 0.28–0.67% santonin. The yield of essential oil varies from 0.28 to 1.02%; the oil contains a large percentage of camphor. According to the data of M.I. Goryaev, A.T. Petushkova and N.A. Sviridova, approximately 0.1% alkaloids were found.

According to the studies of M.I. Goryaev, I.M. Shabanov and L.I. Ignatova (1954), the yield of essential oil from var. *macrosciadia* Poljak. was 0.48% on the basis of air-dried matter and 0.60% on the basis of absolute dry matter. The oil contains 46% cineole, 35% camphor, a small quantity of various organic acids, among which the presence of acetic acid has been determined with some degree of reliability. In higher fractions, there are small quantities of azulene-forming sesquiterpenes. Moreover, the oil contains a coloring substance which imparts a green color. However, the properties of this substance are not yet determined. There is a certain amount of santonin. According to I.V. Larin, due to its unfavorable chemical composition, it is eaten little or none at all by livestock.

Series 13. Leucodes Poljak.—Annuals or biennials; hairs long, erect.

174. *A. leucodes* Schrenk in Bull. Phys. Mathem. Acad. Sc. Pétersb. III (1845) 106, 107; Fedtsch. Perech. Rast. Turk. IV, 193; Poljak. in Tr. Inst. Khim. Akad. Nauk Kaz. SSR, IV, 96.—Exs.: GRF No. 3200.

Biennial or annual. Densely covered with white, long, semi-erect hairs up to end of vegetative period. Root slender, vertical. Stems solitary or few, 30–60(70) cm high, 2–5 mm thick, erect, branched almost from base or in lower half, with more or less straight, upwardly directed branches. Lower cauline leaves petiolate, 3–7 cm long and 2.5–4.0 cm wide, with petioles as long as or longer than lamina, divided up to base into 3 palmately or pinnately parted lobes; terminal lobes lanceolate-linear, acute, 5–10 mm long and 1.0–1.5 mm wide; middle cauline leaves sessile, like auricles divided into ternate, simple, linear lobes; uppermost leaves undivided, sessile, linear-lanceolate. Capitula in lax spreading panicle, remote, less often approximate, 2–3, sessile, upright, ovoid-oblong, 5–7 mm long. Involucral bracts, excluding innermost, pubescent, outer bracts small, broadly deltoid or oval, inner larger, broadly lanceolate or oblong, with narrow, brown scarious border.

Desert sands, as well as outcrops of sandstones and different gypsiferous deposits.—*Soviet Central Asia*: Lake Balkhash Region, Syr-Darya, Kyzyl-Kum, Pamiro-Alai. Endemic. Described from sands along Ili River. Type in Leningrad.

Note. According to the data of M.I. Kurbatov, the yield of essential oil of *A. leucodes* Schrenk is 0.13%. According to the studies of 631 E.I. Satdarova (1954), the presence of the following in the essential oil has been established: 1) carbonyl compounds—camphor comprising 93.26% by weight of the essential oil; 2) terpenic oxides—cin-eole=0.35% by weight of the oil; 3) alcohols and complex esters—a) Cis-pinocampheol comprising 1.02% by weight of the oil, b) bornyl ester of isovaleric acid comprising 1.35% by weight of the oil; 4) sesquiterpenic compounds—a) azulene-forming sesquiterpenes comprising 2.74% by weight of the oil, b) azulene comprising 0.008% by weight of the oil; 5) phenols—cresol 0.009% by weight of the oil; and 6) acids—0.068% by weight of the oil.

According to the data of M.I. Goryaev and R.N. Sazonova (1959), up to 1.1% santonin was found in the plant.

GENUS 1551. *Mausolea* Bge.^{1, 2}

Bge. in Boiss. Fl. or. III (1875) 361, nom. seminudum.

Capitula hemispherical; involucre broadly goblet-shaped of two rows of involucre bracts withering by end of vegetative period; receptacle convex, hemispherical, glabrous. Peripheral florets few, pistillate, fertile, corolla tube absent, less often present and pubescent, style slightly longer than ovary, its lobes lanceolate, with somewhat uneven margin, toothed, straight, erect or divergent, central florets rather numerous, staminate, but with abortive pistil lacking ovary, corolla tubular-conical, with 5 teeth, slightly hairy above, anthers linear, apical appendages of anthers long-acuminate, basal appendages short, round, style of abortive pistil cylindrical, strongly narrowed above and below, stigma broadly and obtusely conical (funnel-shaped), not lobed, with dense, upright, straight, long cilia. Achenes elliptical, densely covered with long, stiff, appressed hairs.

A monotypic genus.

Note. The genus *Mausolea* Bge. usually is well distinguished by the absence of the corolla, and by the lanceolate stigma lobes of the

¹Treatment by P.P. Poljakov.

²From the Greek word *Mausolos*—Mausolus, the king of Caria (about 360 B.C.), in whose memory the lavish tomb, the "Mausoleum," was erected.

peripheral pistillate florets, hairy achenes, form of the style and stigma of the abortive pistil, and also by monocarpy. As regards the pubescence of the achenes, it resembles somewhat the North American genus *Picrothamnus* Nutt., but differs from it by having straight (not curly) hairs and also all the other characters already mentioned.

1. **M. eriocarpa** (Bge.) Poljak. comb. nov.—*Artemisia eriocarpa* Bge. in Mem. Acad. Sc. Pétersb. VII (1854) 336; Boiss. Fl. or. III, 361; Fedtsch. Perech. Rast. Turk. IV, 190; Krasch. in Spisok Rast. Gerb. Fl. SSSR, X (1936) 98, (1949) 48.—**Exs.:** Gerb. Fl. SSSR, Nos. 3189, 3290.

Perennial semishrub, 45–65(70) cm high. Tap root woody, rather thick, with solitary or usually few, erect, woody, branched shoots covered with smooth, whitish, cracking bark; young terminal and lateral flowering branches light brownish, velutinous from short dense hairs. Leaves green, pubescent; lower leaves with petioles thickened at base, (2)3–5 cm long, pinnately cut, their lobes usually 5, linear-lanceolate, 3–7(10) mm long and 1.0–1.5 mm wide, scarcely acuminate, entire or with 1–2 short teeth; middle and upper leaves sessile, divided, into 3–5 lobes or simple; uppermost bracteal leaves simple, linear-lanceolate. Capitula on short or long peduncles, globose, 4–5 mm in dia, remote, sometimes approximate, divergent or more often drooping, in lax, racemose-paniculate inflorescence. Outer involucre bracts roundish-oblong, convex, succulent, later coriaceous, appressed-hairy, inner narrower, oval-elliptical, with scarious border, subglabrous. Peripheral florets 3–7, pistillate, usually lacking corolla tube; central florets 3–17, staminate, corolla tubular-conical, with 5 teeth, hairy in upper part. Achenes densely covered with stiff hairs. Flowering April.

Desert-ridged hummocky or dissected, shifting sand [dunes].—*Soviet Central Asia:* Aralo-Caspian Region, Lake Balkhash Region, Kara-Kum, Kyzyl-Kum. *General distribution:* Iran. Described from Kyzyl-Kum from Lehmann's collections. Type in Leningrad.

GENUS 1552. **Turaniphytum** Poljak. Gen. Nov.^{1,2}

Poljak. in Addenda, XXV, 880 and in Fl. Turkm. VII (1960) 132, description in the Russian.

Capitula heterogamous, with few (2–10) flowers, partly pistillate and partly staminate, with abortive pistil; borne in clusters of 6–18 in

¹Treatment by P.P. Poljakov.

²From the distribution of the genus in the Turanian lowland and the Greek word *phyton* — plant.



1 — *Neopallasia pectinata* (Pall.) Poljak., habit, peripheral pistillate floret, style, bisexual disk floret, anther, longitudinal section of the involucre and receptacle, placement of achenes in the capitulum; 2 — *Ajania pallasiana* (Bess.) Poljak., habit, peripheral pistillate floret, pistil of the bisexual disk floret, anther, pistil, achene, outer and inner involucre bracts.

635 dense, more or less globose glomerules, 3–8 mm in dia, in turn aggregated in long, spicate, sometimes more or less branched at base of inflorescence, less often capitula solitary and then with a large number of florets (up to 27). Involucre cupulate, 1.0–1.5 mm in dia, less often 2.0–2.5 mm, with almost equal involucre bracts, some bracts adjacent to pistillate florets carinate. Receptacle usually weakly convex, glabrous. Peripheral pistillate florets in axils of carinate involucre bracts; their corollas tubular, small, strongly reduced in length in comparison to width, apically with short, irregular, 2–3 teeth; corollas of staminate florets (having only inconspicuous rudiment or ovary) much larger, also tubular, with 5 deltoid teeth, tube long gradually narrowed toward throat, with long and erect hairs at apex, more or less pinkish; anthers lacking basal appendages, apical appendages oblong-lanceolate, acute; style in pistillate florets bifid, their branches linear, divergent; stigma of abortive pistil in staminate florets not divided, conical. Achenes oblong-obovoid, more gradually narrowed toward base, somewhat flattened from sides, with inconspicuous veins; pappus absent. Perennial, herbs, usually with many stems from base; leaves more or less pinnatipartite.

Two species of the genus are found in Soviet Central Asia and Kazakhstan; probably they also extend to the territories of China and Iran.

Type of genus: *Turaniphytum eranthemum* (Bge.) Poljak.

1. Capitula 1.0–1.5 mm in dia, with 3–10 flowers, 6–18, compactly clustered in more or less globose glomerules 1. **T. eranthemum** (Bge.) Poljak.
- + Capitula 2.0–2.5 mm in dia, not forming globose glomerules 2. **T. kopetdaghense** Poljak.

1. **T. eranthemum** (Bge.) Poljak. comb. nova.—*Artemisia eranthema* Bge. in Mém. Acad. Sc. Pétersb. VII (1854) 339; Boiss. Fl. or. III, 361; O. and B. Fedtsch. Perech. Rast. Turk. IV, 192.

Perennial. Plant 15–35 cm high, grayish from rather sparse long hairs. Root thick and usually many-headed, with flowering and short nonflowering shoots. Stems usually rather numerous, erect or basally ascending, simple (less often with few lateral branches), relatively sparsely leafy. Basal and lower cauline leaves long-petiolate, up to 8 cm long and 3 cm wide, their laminae oblong to almost round, usually twice pinnately cut, with 1–3 pairs of lobes, terminal lobes linear or lanceolate, subacute; upper cauline leaves with shorter petioles (uppermost leaves often sessile) and less divided (to undivided and entire, linear). General inflorescence spicate, usually simple, consisting

636 of mostly globose glomerules 3–8 mm in dia, in axils of apical leaves; glomerules of 6–18 compactly clustered capitula with 3–10 flowers 1.0–1.5 mm in dia; corolla of pistillate florets in axils of carinate involucre bracts, 0.5–0.8 mm long; corolla of staminate florets 2–3 mm long, with long hairs at apex and more or less pink. Achenes 1.0–1.4 mm long. Flowering May to June. (Plate XXX, Fig. 1).

Sandy steppes and deserts.—*Soviet Central Asia*: Aralo-Caspian Region (southeastern part), Lake Balkhash Region (southern part), Syr-Darya (northern part). *General distribution*: Possibly Dzhungaria-Kashgaria. Described from southern Kazakhstan. Type in Leningrad.

2. **T. kopetdaghense** Poljak. sp. nova in Addenda, XXV, 881 and in Fl. Turkm. VII (1960) 134, description in the Russian.—*lc.*: Poljak. Ibid. (1960) Plate XXII.

Perennial. Plant 15–25 cm high, grayish from quite long soft hairs, with thick, woody, many-headed root. Stems usually very numerous, erect or basally ascending, simple, sparsely leafy. Basal and lower cauline leaves long-petiolate, 3.5–6.0 cm long and 1.2–1.5 cm wide, their laminae oblong, twice pinnately cut, with 2–3 pairs of lobes, terminal lobes 3–5 mm long and 0.4–0.6 mm wide, linear, subacute; upper cauline leaves smaller and less divided, often sessile, transitional to undivided, linear, apical leaves. General inflorescence spicate; capitula sessile, ovoid to subglobose, 2.0–2.5 mm in dia, more or less crowded or partly remote. Involucre of fewer bracts. Peripheral pistillate florets 8–9, in axils of carinate involucre bracts, their corollas small, with 2–3 irregular teeth; staminate florets 16–18, their corollas conically tubular, with 5 teeth bearing long hairs at apex, more or less pinkish. Achenes 1.2–1.4 mm long. Flowering June to September.

Stony slopes at 2,400–3,000 m.—*Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Probably Iran. Described from Kopetdag. Type (Kopetdag Mountains, 2 km east of the village of Sibir, collected on 24.VIII. 1947 by V. Nikitin) in Leningrad.

GENUS. 1553. **Neopallasia** Poljak.^{1, 2}

In Bot., Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 429.

Capitula ovoid, in almost spicate or narrowly paniculate inflorescences; receptacle narrowly conical, glabrous. Florets heterogeneous; peripheral florets 3–4, pistillate, fertile, their corollas

¹Treatment by P.P. Poljakov.

²Named in honor of the naturalist P.S. Pallas.

637 narrowly tubular, not lobed (lacking teeth), stigma lobes narrowly linear, weakly divergent, short-ciliate; disk florets bisexual, usually 9–16, of which 4–8 in lower part of receptacle [outer], fertile, others at apex of receptacle sterile, their corollas tubular-conical, bluish or pinkish, with 5 teeth, glabrous, anthers linear-lanceolate, apical appendages of anthers round, apically attenuate, acute; stigma lobes linear, short-ciliate, after flowering divergent. Achenes somewhat flat, narrow, deltoid, finely sulcate, at base of receptacle in single row. Annuals with pinnately pectinate leaves.

A monotypic genus.

1. **N. pectinata** (Pall.) Poljak. Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 428.—*Artemisia pectinata* Pall. Reise, III, Anhang. (1776) 755, tab. H, h, f, 2; Willd. Sp. pl. III, 1824; Bess. in Nouv. Mém. Soc. Nat. Mosc. III, 84; DC. Prodr. VI, 120; Ldb. Fl. Ross. II, 593; Turcz. Fl. baic.-dahur. II, 2, 66; Maxim. in Bull. Acad. Pétersb. VIII, 529; Fedtsch. Perech. Rast. Turk. IV, 200; Pampan. in Nuov. Giron. bot. Ital. n. s. XXXIV, 684; Kryl. Fl. Zap. Sib. XI, 2816.—**Exs.**: GRF Nos. 3154, 3299, (sub *Artemisia pectinata*).

Annual. Root slender, vertical. Stems most often few or solitary, erect, ascending only at base, 12–40 cm high, violet or brown, more or less densely covered with bifid flexuous hairs, with strongly reduced or sometimes elongate branches from leaf axils, less often almost simple. Leaves green, usually glabrous, smooth, sessile, with flat, gradually expanded base, lamina oblong, pinnately pectinate, their lobes stiff, filiform-subulate, with short, spine-like, cartilaginous, acuminate apex, undivided or with 1–2 similarly narrow lobes; lower and middle cauline leaves 1.5–3.0 cm long and 0.5–1.0 cm wide; upper bracteal leaves somewhat shorter and narrower. Capitula sessile or subsessile, ovate, 3–4(5) mm long, in axils of upper leaves, in groups of few or solitary on branches, forming more or less dense, almost spicate or narrowly paniculate inflorescence. Involucral bracts oval, smooth; herbaceous, with wide, whitish, scarious border; outer bracts somewhat shorter and narrower than inner. Receptacle narrowly conical, glabrous. Peripheral florets pistillate, fertile, usually 3–4, their corollas narrowly tubular, not lobed, white membranous, other florets bisexual, of which 4–8 at base of receptacle fertile, remaining florets at apex of receptacle, sterile, their corollas tubular, with 5 teeth, bluish or pinkish. Achenes 1.2–1.5 mm long, ellipsoid, somewhat flat, narrow, triangular, dark brown, finely sulcate, in lower part of receptacle in a single closed row. Flowering August. (Plate XXXI, Fig. 1).

Loamy and loamy-sand plains in desert-steppe zone.—*Eastern Siberia*: Dauria; *Soviet Central Asia*: Dzhungaria-Tarbagatai (Chilikta

638 valley in Tarbagatai), Tien Shan (Issykkul basin). *General distribution*: Dzhungaria-Kashgaria, Mongolia. Described from southern Trans-Baikal. Type in London.

Note 1. It is a very distinct genus differing from all other genera of the subtribe by having two groups of distinctly different flowers in the capitulum. The first group, consisting of vestiges of bisexual florets situated in the upper part of the narrowly conical receptacle and closely adjoining each other, forms a unique screen that covers the capitulum from above. Because of this, the fertile pistillate and bisexual florets (second group) situated below seem to be self-pollinating. Beside this, the form and disposition of the achenes, anthers, and corolla of the pistillate florets further emphasize the morphological and biological uniqueness of the genus *Neopallasia*, which is adapted to the severe climatic conditions of Soviet Central Asia.

Note 2. Pampanini (Pampan. op. cit. 684) segregates *A. pectinata* var. *yunnanensis* Pamp.—a perennial growing in Yunnan Province. On the basis of this character, Krascheninnikov (*Mat. po Istor. Fl. i Rast. SSSR*, III (1958) 126) even proposed to treat it as a new species—*A. yunnanensis* (Pamp.) Krasch. However, the absence of collections and the brief diagnosis force me to refrain from commenting on this taxon.

Economic Importance. According to the data of M.I. Goryaev and R.N. Sazonova (1959), the yield of essential oil is 0.06%; the oil contains aldehydes, phenols, and ketones.

Tribe 8. SENECTIONEAE Cass. in Bull. Soc. Philom. Paris (1815) 173 and in Dict. Sc. Nat. XX (1821) 377, XLVIII (1827) 446, LX (1830) 582; O. Hoffm. in Pflanzenfam. IV, 5 (1890–1894) 283.—Trib. *Senecionidae* Less. Subtrib. *Senecioneae* Less. Synops. Comp. (1832) 387; DC. Prodr. VI (1837) 292 p. p.—Trib. *Senecionideae* Benth. in Benth. and Hook. fil. Gen. Pl. II (1873) 206.—Fam. Senecionidaceae Bessey in Ann. Miss. Gard. 2 (1915) 164.—Capitula heterogamous or less often homogamous, with distinct ray of peripheral pseudoligulate florets or lacking ray. Receptacle usually glabrous, less often hairy. Anthers basally obtuse, sagittate or auriculate. Style branches of bisexual florets mostly thickened, usually truncate, less often acuminate, filiform-clavate, without or with more or less distinct appendage; style apices to variable length (at apex, or only below appendage or finally, up to branching of styles) covered with papillae or hairs or tuft of hairs or with terminal corona of upright hairs; corolla yellow, less often lilac, reddish, white or of other shades; capitula mostly homochromous, less often heterochromous. Leaves alternate, only very rarely (in our genera!) opposite.

639 Herbs, semishrubs and shrubs, widely distributed over the world. There are fewer arborescent forms of *Senecioneae* in the tropics.

KEYS TO THE IDENTIFICATION OF GENERA OF THE TRIBE

*Senecioneae*¹

1. Flowering shoots lacking normal green leaves, with only scaly leaves², sometimes colored 2.
- + Flowering shoots with normal green leaves 4.
2. Plants monoecious. Flowering shoots terminating in single comparatively large capitulum, 2.0–2.5 cm in dia, drooping at achene maturity. Peripheral pistillate florets distinctly ligulate, many whorled, bright- or golden-yellow 1554. **Tussilago** L.
- + Plants dioecious or almost dioecious. Flowering shoot most often terminating in several or many capitula aggregated into spicate, paniculate, corymbose or umbellate inflorescence; only very rarely flowering shoots terminating in single capitulum, but then capitulum much smaller 3.
3. Corolla of peripheral pistillate florets distinctly ligulate. Capitula mostly aggregated in corymbose inflorescence (very rarely capitula solitary). Plants dioecious with small basal leaves..... 1556. **Nardosmia** Cass.
- + Corolla of peripheral pistillate florets filiform-tubular or oblique along margin, lacking distinct ligules. Capitula mostly aggregated in spicate or spicate-paniculate overall inflorescence. Plants not completely dioecious, with large basal leaves 1559. **Petasites** Mill.
4. Receptacle pubescent; leaves opposite, only in very rare cases uppermost leaves obliquely opposite or even alternate; capitula most often solitary, less often many 1558. **Arnica** L.
- + Receptacle glabrous or if hairy (less often!), and then leaves alternate 5.
5. Leaves evergreen (wintering), coriaceous; basal leaves (particularly along veins beneath), as also stems (particularly, younger ones), densely covered with thick, rusty hairs. One species; in USSR found only in Carpathians 1557. **Homogyne** Cass.
- + Leaves not evergreen (withering before winter), or plants with other types of hairs 6.

¹Prepared by M.E. Kirpicznikov.

²Usually modified petioles in origin.

- 640 6. Peripheral achenes lacking pappus, central with pappus or if all achenes with pappus, then peripheral achenes with a single row of bristles, but with several rows in central achenes 1559. **Doronicum** L.
 + All achenes with identical pappus 7.
 7. Capitula homogamous; all florets tubular 10.
 + Capitula heterogamous; peripheral florets mostly ligulate or less often filiform-tubular, different from central florets 8.
 8. Peripheral florets filiform-tubular. Exclusively introduced plants; in USSR found only in Carpathians and Western Transcaucasia 1560. **Erachtites** Raf.
 + Peripheral florets ligulate 9.
 9. Involucral bracts dimorphic, distinctly or indistinctly two-rowed, inner bracts broader, with wide scarious margin, outer bracts narrower, without scarious border or very narrow border; 1–3 additional bracts may be present at base of involucre. Style branches acuminate or obtuse and hairy only on outside, sometimes hairy the whole length down to their point of branching 1564. **Ligularia** Cass.
 + All involucral bracts identical, one-rowed; on outside of this involucre at its base is found a complete row of bracts, most often much shorter than involucre, but sometimes as long. Style branches truncate, with crown of hairs at their very tip 1563. **Senecio** L.
 10. Basal leaf one, lamina dorsally pubescent until its unfolding and involute around petiole as in compound unbel; cotyledon only one, longitudinally revolute 1562. **Syneilesis** Maxim.
 + Basal leaves absent, or if present then of different type; cotyledons 2 11.
 11. Florets whitish or more rarely reddish; capitula with few, mostly 5–10(12) flowers; style branches acuminate, only on outside covered with hairs 1561. **Cacalia** L.
 + Florets yellow, orange, purple, or violet; capitula many-flowered; style branches truncate, with crown of hairs 1563. **Senecio** L.

Subtribe Senecioninae O. Hoffm. in Pflanzenfam. IV, 5(1890–1894) 286.—Subtrib. **Tussilagineae** Benth. and **Eusenecioneae** Benth. in Benth. and Hook. fil. Gen. Pl. II (1873) 207, 208.—Involucre mostly one-rowed, mostly with identical bracts, free or fused at base; often
 641 with one more row of reduced, very short bracts at base of involucre (forming so-called “involucrum calyculatum”). Pappus mostly of simple, setaceous hairs.

Note. Following basically Hoffman's system, I retain the genus *Tussilago* in the subtribe *Senecioneae*, although it is hardly justified.

A. Cassini with full justification erected a separate group *Tussilagineae* with the rank of tribe. The same *Tussilagineae*, but already with the rank of subtribe, was recognized by Bentham, and also after him by Boissier. A separate subtribe, but by the name *Tussilaginanae*, is also recognized in the work of the renowned contemporary American specialist on the Compositae, P.A. Rydberg (*Carduaceae in North American Flora*, Vol. 34, 4, 1927, p. 309).

GENUS 1554. *Tussilago* L.^{1, 2}

L. Sp. pl. (1753) 865.—*Farfara* Gilib. Fl. Lith. III (1781) 177.

Capitula solitary, small, cylindrical; involucre bracts one-rowed, lanceolate, acuminate. Receptacle glabrous, flat; central florets sterile, bisexual; corolla tubular-campanulate, with 5 teeth; stigma undivided, clavate; peripheral florets pistillate, ligulate, in several rows, fertile, with bilobate stigma; achenes with 5–10 ribs, cylindrical; pappus of numerous simple hairs. Herbaceous perennials, with long creeping rhizome; flowering shoots covered with scale leaves. Basal leaves appear only after flowering, roundish-cordate, angular, coriaceous, white-pubescent beneath.

The genus is monotypic, occurring in the temperate zone of Eurasia; introduced in America.

1. **T. farfara** L. Sp. pl. (1753) 865; DC. Prodr. V, 208; Ldb. Fl. Ross. II, 470; Boiss. Fl. or. III, 377; Schmalh. Fl. Yugo-Zap. Ross. 305; Kryl. Fl. Zap. Sib. XI, 2822; Grossh. Fl. Kavk. IV, 143; Fl. Turkm. VII, 138; Grigorjev, Opred. Rast. Okr. Stalinabada, 277; Gilib. Fl. Lith. III, 177.— **Ic.**: Fedtsch. and Fler. Fl. fig. 985; Hegi, Ill. Fl. VI, fig. 383–385, tab. 256, fig. 1, 1a.— **Exs.**: Fl. pol. exs. No. 540.

Perennial. Rhizome long, creeping; flowering shoots 10–25 cm high, covered with scaly, appressed, ovate-lanceolate, acute leaves, mostly purple-violet. Basal leaves appear after anthesis, long-petiolate, roundish-cordate, 10–25 cm wide, angular, with irregular teeth, coriaceous, floccose on both sides, but later glabrous above, whitish-tomentose with soft hairs. Capitula solitary, 2.0–2.5 cm in dia, drooping. Florets golden yellow; pappus 4–5 times as long as achenes. Flowering April to May.

¹Treatment by L.A. Kuprianova.

² From the Latin words *tussis*—cough, and *agere*—to bring to motion, to enable; named for the medicinal use of the plant.

Widely distributed; found on young alluvial deposits, both clayey and sandy, or leached soils, on slopes along bottoms of ravines and on railroad embankments; also distributed in middle mountain zone on rock outcrops and along banks of mountain streams and rivers.—*European part*: All regions; *Caucasus*: Ciscaucasia, Dagestan Eastern and Western Transcaucasia; *Western Siberia*: Upper Tobol, Ob River Area, Irtysh, Altai; *Eastern Siberia*: Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: Ussuri (vicinity of Vladivostok); *Soviet Central Asia*: Lake Balkhash Region, Dzhungaria-Tarbagatai, Amu-Darya, Syr-Darya, Pamiro-Alai Region, Tien Shan, mountainous Turkmenia. *General distribution*: Western Europe, northern Africa, Balkans-Asia Minor, Iran, Indo-Himalayas; introduced into North America. Described from western Europe. Type in London.

GENUS 1555. *Petasites* Mill.^{1, 2}

Miller, Gard. Diet. ed. 4 (1754); Gaertn. De fruct. et sem. II (1791) 406, t. 166; Cass. in Dict. Sc. Nat. XXXIV (1825) 199; DC. Prodr. V (1836) 206.

Capitula short-cylindrical or campanulate, about 1 cm in dia, with one-rowed involucre, aggregated into spicate-paniculate, ovoid, less often in almost corymbose inflorescence, not fully dioecious; staminate capitula with few peripheral, pistillate, tubular florets and numerous central bisexual, tubular-campanulate florets with 5 teeth; pistillate capitula with numerous peripheral, filiform, obliquely cut or weakly ligulate, pistillate, fertile florets and few central sterile, bisexual florets. Receptacle glabrous; style bilobed. Achenes terete, with longitudinal ribs; pappus consisting of a few rows of simple hairs, 3–3.5 times as long as achenes. Perennials with branched, creeping rhizomes, large basal leaves, and flowering shoots bearing only scale-leaves (modified petioles).

The genus *Petasites* is distributed in western Europe, Asia Minor, Caucasus, the European part of the USSR, Soviet Central Asia, in the north and south of Western Siberia, on plains and in hilly regions, not higher than the timberline. Its species composition is insufficiently studied; the Caucasian material especially needs a monographic treatment.

¹Treatment by L.A. Kuprianova.

²From the Greek word *petasos*—sun-hat; so named because of the size of the leaves.

1. Basal leaves deltoid-cordate, with 2–3 lobes at base; cauline leaves long, up to 15 cm, lanceolate-linear, with broadened acute apex; corolla yellowish 1. **P. spurius** (Retz.) Rchb.
- 643 + Basal leaves orbicular-cordate; cauline leaves ovate, 5–8 cm long; corolla purplish or yellowish-white 2.
2. Rhizome in upper part tuberculate; corolla purplish, stigma lobes oval 2. **P. hybridus** (L.) Gaertn.
- + Rhizome uniformly thickened; corolla yellowish-white; stigma lobes linear-lanceolate, acuminate 3. **P. albus** (L.) Gaertn.

1. **P. spurius** (Retz.) Rchb. Fl. exc. (1830–1832) 279; Ldb. Fl. Ross. II, 469; Hegi, Ill. Fl. VI, 691, fig. 402; Fl. Yugo-Vost. VI, 364; Kryl. Fl. Zap. Sib. IX, 2824; Vozn. Rosl. 550; Majeovski Fl. 588.—*P. niveus* Ldb. Fl. Ross. II (1846) 469, non Baumg.—*P. tomentosus* (Ehrh.) DC. Prodr. V (1836) 207; Schmalh. Fl. II, 80.—*Tujssilago spuria* Retz. Obs. I (1779) 29, t. 2.—*T. tomentosa* Ehrh. Beitr. III (1788) 65.—*Nardosmia spuria* Less. in Linnaea, IX (1834) 196.—**lc.**: Fl. Yugo-Vost. VI, 364, fig. 688.—**Exs.**: GRF No. 219; Fl. Polon. exs. No. 539.

Perennial. Rhizome long, creeping, 5–10 mm thick, with filiform roots at nodes. Basal leaves coriaceous, with long, white-tomentose petioles, 6–12 cm long, deltoid-cordate, with 2–3 lobes at base, irregularly and finely sinuate-toothed, young leaves white-tomentose on both sides, older leaves subglabrous or floccose above, white-tomentose beneath. Stems up to 70 cm high. Cauline leaves amplexicaul, glabrous, broadly lanceolate; upper leaves lanceolate-linear, usually with long, thin, attenuate apex, 8–15 cm long and 2–3 cm wide. Inflorescence corymbose-spicate with 12–15(30) florets [capitula?]. Capitula 5–8 mm long, 1.0–1.5 cm in dia; pistillate florets white or whitish-yellow; stigma of bisexual florets ovate. Achenes a fourth to a third as long as pappus, terete, somewhat ribbed, 1.5–2.0 mm long; pappus hairs in many rows, with several cilia. Flowering and fruiting May.

Along sandy banks of rivers and lakes, sometimes forming continuous stands, often in forest-steppe and steppe regions.—*European part*: Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Lower Don; *Western Siberia*: Ob River Area, Upper Tobol (west), Irtysh; *Soviet Central Asia*: Aralo-Caspian Region (northern part), Tien Shan (north), Lake Balkhash Region (east), Syr-Darya. *General distribution*: Central and northern Europe. Described from western Europe.

2. ***P. hybridus*** (L.) Gaertn. Mey. and Scherb. Fl. Wett. III (1801) 184; Hegi, Ill. Fl. VI, 683; Szaf. Kulcz. Pawl. Rosl. Polskie, 631; Grossh. Fl. Kavk. IV, 144.—*P. officinalis* Moench. Meth. (1794) 568; Ldb. Fl. Ross. II, 468; Schmalh. Fl. 79; Vizn. Rosl. 550.—*Tussilago hybrida* L. Sp. pl. (1753) 866.—*T. petasites* MB. Fl. taur.—cauc. II (1808) 305.—*P. georgicus* Mand. in Zam. po Sist. i Georg. Rast. Tbil., 13 (1947) 76; Fl. Gruzii, VIII, 389.—**lc.:** Hegi, Ill. Fl. VI, taf. 266, fig. 2.—**Exs.:** Pl. Finl. exs. No. 392; Fl. Polon, exs. No. 357.

- 644 Perennial. Rhizome long, thick, in upper part nodulose, tuberculate, up to 3–5 cm. Basal leaves long-petiolate, larger, up to 60 cm and more wide, roundish-deltoid, cordate, with 2–3 lobes on each side, with irregular, small, deltoid teeth, subglabrous, scabrous from small spiny hairs, grayish-white, tomentose beneath. Stems up to 60 cm high, 10–20 mm thick, white-tomentose. Cauline leaves (leafy petioles) sometimes with considerable lamina, basally violet, white-tomentose in upper part, lower leaves broadly ovate, 5–10 cm long and 1.5–2.0 cm wide, upper lanceolate. Inflorescence dense, spicate, with many florets [capitula?], 6–10 cm long, up to 20 cm at fruiting; capitula 5–8 mm long, about 6–8 mm in dia. Florets dirty purple, with violet tinge, aromatic, style lobes in bisexual florets short and obtuse. Flowering April to May.

Wet forest meadows, along banks of rivers and streams.—*European part*: Ladoga-Ilmen, Upper Volga, Upper Dnieper, Middle Dnieper, Bessarabia, Black Sea Region, Crimea, Lower Don; *Caucasus*: Ciscaucasia, Dagestan, Eastern and Western Transcaucasia (Baku), Talysh (Lenkoran). *General distribution*: central Europe, southern Scandinavia. Described from western Europe. Type in London.

Note. *P. georgicus* Mand., described from the vicinity of Tbilisi, differs from *P. hybridus* (L.) Gaertn. by having a yellowish-white corolla and, as I.P. Mandenova reports, a thin acuminate stigma in the staminate florets; all other characters (size and form of the capitula, structure of the inflorescence, leaves, and rhizome) are the same as in *P. hybridus*. Final resolution of the question whether *P. georgicus* is a separate species must be deferred until more complete collections are available.

3. ***P. albus*** (L.) Gaertn. De fruct. et sem. II (1791) 406; Ldb. Fl. Ross. II, 469; Szaf. Kulcz. Pawl. Rosl. Polskie, 632; Schmalh. Fl. II, 79; Vizn. Rosl. 550; Grossh. Fl. Kavk. IV, 144.—*Tussilago alba* L. Sp. pl. (1753) 866.—**lc.:** Hegi, Ill. Fl. IV, 693, fig. 405.

Perennial. Rhizome long, not thick, nodulose, with filiform roots. Basal leaves orbicular-cordate, with angular, acute and coarse teeth,

cordate, subglabrous above, whitish-pubescent, floccose beneath. Stems slender, 30–60 cm high, white-tomentose, arachnoid-hairy. Cauline leaves (petioles of leaves) lacking lamina, oblong-ovate, along margin and in upper part arachnoid-white-tomentose, attenuate-acuminate, 2–3 cm long and 5–8 mm wide. Inflorescence lax, almost corymbose at flowering, later spicate-paniculate, 15–30 cm long, with 10–15(25) flowers. Capitula 15 mm long and 5–8 mm in dia. Involucral bracts 6–8 mm long. Florets greenish-yellowish-white; style lobes of bisexual florets linear-lanceolate, acute. Flowering April to May.

645 Banks of rivers and mountain streams.—*European Part*: Baltic Region, Upper Dniester; *Caucasus*: Ciscaucasia, Eastern and Western Transcaucasia. *General distribution*: Northern and Central Europe, Atlantic Europe. Described from western Europe. Type in London.

Note. *P. kablikianus* Tausch. is similar to *P. albus* (L.) Gaertn.; it is distinguished by leaves that have smooth margins and lack coarse teeth, the absence of conspicuous white hairs, and a yellowish-white corolla. This species does not occur in the USSR; it is distributed in the Sudety and Tatra mountains and was mistakenly cited in the *Vizn. Rosl. URSS* for the Soviet Carpathians.

GENUS 1556. *Nardosmia* Cass.^{1, 2}

Cass. in Dict. Sc. Nat. XXXIV (1825) 186; Ldb. Fl. Ross. II (1844–1846) 466; DC. Prodr. V (1836) 205.—*Tussilago* L. Sp. pl. (1753) 865, pro parte.—*Petasites* Kom. in Tr. Peterb. Bot. Sada, XXV (1907) 683, non Mill.

Capitula with one-rowed involucre, dioecious; staminate capitula with small, numerous, pistillate, distinctly ligulate florets and numerous, sterile, bisexual florets with 5 teeth; pistillate capitula with numerous peripheral ligulate pistillate fertile florets and few, central, bisexual florets. Receptacle glabrous. Style of tubular-infundibuliform florets not thickened below stigma (except *N. japonica* S. and Z.); stigma bifid, its lobes lanceolate, oblong-lanceolate, or linear, less often short, oval or short-lanceolate. Achenes terete, with longitudinal ribs; pappus many-rowed, consisting of simple hairs, 2.5–3.5 times as long as achenes. Perennial, with creeping, branched rhizome; basal leaves smaller than those of *Petasites*, flowering shoots bearing scale leaves (modified petioles).

¹Treatment by L.A. Kuprianova.

²From the Latin words *nardus*—the ancient name of an aromatic balsam, and *osme*—aroma; named for the aroma of the plant.

Species of this genus are distributed in Eurasia, North America, Japan, Sakhalin, Kuril Islands, China and Mongolia. They grow in mountainous regions on stony slopes and balds, in alpine meadows, tundra zone, peat bogs and along banks of rivers and streams in the north of the forest zone.

Type of genus: *N. denticulata* Cass.

Note. The genus *Nardosmia* is similar to *Petasites*. However, it usually has been kept separate by the authors of Russian floras. The main differences between these genera are as follows: the genus *Nardosmia* has a distinctly ligulate corolla in the peripheral pistillate florets, a corymbose (not spicate) inflorescence, and small basal leaves. The range of the genus *Nardosmia* mainly extends over Eurasia and
646 North America, whereas that of the genus *Petasites* is mainly Central Europe. Ecologically, these genera, also are different. Species of the genus *Petasites* are mainly found in the forest or mountain-forest zones, often in association with the broad-leaved forests, while species of the genus *Nardosmia*, with few exceptions, are the members of tundra zone or high-altitude regions.

1. Plants short, with solitary capitulum or, less often only in pistillate forms, with 2–3 capitula. Rhizome slender, cordlike, up to 2 mm thick 2.
- + Plants tall, with numerous capitula aggregated in corymbose inflorescence; rhizome thicker, up to 2–3 cm 3.
2. Leaves oval, cuneate at base, glabrous above, white-tomentose beneath; capitula in pistillate forms sometimes 2–3 8. ***N. gmelini*** (Turcz.) DC.
- + Leaves deltoid, with cordate base, glabrous on both sides, capitula always solitary 9. ***N. glacialis*** Ldb.
3. Leaves palmately incised or palmately dissected almost halfway into 7–8 wide lobes, each in turn cut into 3 acute lobes; florets light violet or white 6. ***N. palmata*** (Ait.) Hook.
- + Leaves entire, finely or coarsely toothed 4.
4. Leaves 60 cm, up to 1.5 cm wide, finely and acutely toothed, cauline leaves of staminate individuals broadly ovate, up to 5 cm wide, oblong in fertile pistillate forms, 1.5–2 cm wide 7. ***N. japonica*** S. and Z.
- + Leaves smaller 5.
5. Florets yellow, whitish-yellow or white; leaves deltoid-reniform or reniform, finely toothed 6.
- + Florets reddish, pink, or white; leaves deltoid, coarsely toothed 8.

6. Leaves deltoid-reniform, (10)20–35 cm wide, glabrous on both sides, coriaceous; florets yellow; capitula 7–15, in corymbose inflorescence 5. *N. laevigata* (Willd.) DC.
- + Leaves reniform, with round apex, 2–7 cm wide and 2–5 cm long; florets white; capitula 3–10, in corymbose inflorescence 7.
7. Petioles of basal leaves somewhat expanded, amplexicaul; pistillate florets 3.0–3.5 mm long, with 1 mm-long ligule; staminate florets 9–11 mm long 1. *N. saxatilis* Turcz.
- + Petioles of basal leaves hardly expanded, pistillate florets ligulate, limb 5–6 mm long, 2.0–2.5 mm wide; staminate florets 8.0–9.5 mm long 2. *N. fomini* Bordz.
8. Leaves broadly deltoid, cordate, 15–20 cm long and up to 20 cm wide, coarsely toothed, teeth 3–4 cm long and as wide, deltoid and acuminate, in turn divided into unequal, acuminate, small teeth, grayish-tomentose beneath, glabrous above. Florets white or pink 3. *N. angulosa* Cass.
- + Leaves deltoid or oblong-deltoid, 3–6 cm long and 3–4(6) cm wide, with 7–8 coarse, obtuse teeth. Florets reddish. 4. *N. frigida* (L.) Hook.

Subgenus 1. Nordosmia.—Inflorescence corymbose, with numerous capitula. Style of central tubular-infundibuliform florets thickened or not below stigma. Stigma bilobed, with oblong-lanceolate lobes.

Section 1. Nardosmia.—Peripheral florets ligulate; style below stigma lacking a ring but thickened.

Series 1. Saxatiles Kuprian.—Leaves small, reniform, with round apex, sinuate-toothed with acute teeth; florets white. High-mountain plants. Besides our species, we should also include *N. fragrans* (Vill.) Rchb. and *N. dörfleri* (Hay) Kuprian. comb. n. from southern Europe.

1. *N. saxatilis* Turcz. in Bull. Soc. Nat. Mosc. I (1838) 94 nomen; ibid., XIX, 11 (1846) 138; Fl. baic.-dahur. II, 4.—*N. laevigata* subfoemina DC. Prodr. V (1836) 205, pro parte; Ldb. Fl. Ross. II, 466; Kryl. Fl. Zap. Sib. XI, 2826.—*Petasites saxatilis* Kom. in Tr. Peterb. Bot. Sada, XXV (1907) 684.—**Ic.:** Gmel. Fl. sib. II (1749) tab. 68, fig. 2.

Perennial. Rhizome slender, 2–3 mm thick, filiform. Basal leaves small, petiolate, 3–10 cm long, reniform, with round apex, cordate, 2–7 cm wide, 2–5 cm long, sinuate sharp-toothed, petiole and particularly along veins covered with short thick hairs. Stems 5–15(30) cm high, white-tomentose above. Cauline leaves amplexicaul, ovate-lanceolate,

1.5–2.0 cm long, 0.5–1.0 cm wide, glabrous, along margin with short, white-tomentose, fimbria. Capitula 9–10, conical, 9–12 mm long, about 10 mm wide, in corymbose inflorescence. Florets white; sterile capitula with only staminate florets having infundibuliform corolla, 9–11 mm long; styles of staminate florets thickened below stigma, scarcely exceeding corolla; stigma shortly bilobed, pubescent; pistillate florets 3.0–3.5 mm long, with ligule about 1 mm long, with 2–3 teeth at tip, styles of pistillate florets not thickened below stigma. Achenes smooth, 1/4 as long as pappus. Flowering May to June; Fruiting June.

Alpine regions and adjoining forests, stony mountain slopes, high balds, on banks of streams.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, Dauria; *Far East*: Zeya-Bureya, Uda River Area. *General distribution*: northern Mongolia, northeastern China. Described from the collection of Turczaninow from Kultuk. Type in Leningrad.

648 **Note.** *N. saxatilis* Turcz. greatly resembles the alpine Caucasian species *N. fominii* Bordz., the only member of the genus *Nardosmia* in the Caucasian flora.

2. *N. fomini* Bordz. in Zap. Kievsk. Obshch. Estestv. XXV (1915) 123; Grossh. Fl. Kavk. IV, 144.—**lc.**: Bordz. Ibid., Fig. 5.

Perennial. Rhizome branched, 1–2 cm thick, filiform. Basal leaves long-petiolate, cordate-reniform, 3–6 cm wide, 2–4 cm long, apically roundish, sinuate-sharp-toothed, glabrous; petioles glabrous, at base slightly broadened and somewhat amplexicaul; cauline leaves amplexicaul, ovate or ovate-lanceolate. Stem 12–25 cm high, in upper part arachnoid-white-hairy. Capitula large, 1.5 cm in dia, 5–7 in corymbose inflorescence. Involucral bracts oblong-lanceolate, acuminate, ventrally glabrous, with short, papilliform hairs at base. Florets white, peripheral florets pistillate, ligulate, ligule (4.5)–5–6 mm long and 2.0–2.5 mm wide corolla of staminate florets infundibuliform, 8.0–9.5 mm long, their styles slightly exerted from corolla, bifid, weakly thickened. Achenes terete; pappus bristles simple, 2.5–3 times as long as achene. Flowering May.

Alpine meadows.—*Caucasus*: Main Range. Endemic. Described from cultivated specimens brought from Gudaur District. Type in Tbilisi.

Series 2. Frigidae Kuprian.—Plants with deltoid leaves, with coarse, undivided, deltoid teeth or teeth in turn divided into unequal, acute small teeth; florets reddish, pink, or bright white. Plants of tundra plains and peat marshes of the north of the forest zone.

3. *N. angulosa* Cass. Dict. Sc. Nat. XXXIV (1825) 188, excl. syn. Linn.; Less. in Linnaea, VI (1831) 107.—*N. frigida* Hook. Fl. bor. am.

I (1833) 307; DC. Prodr. V, 205; Ldb. Fl. Ross. II, 467; Kryl. Fl. Zap. Sib. XI, 2823, pro parte.—*Petasites frigidus* Fries Summa Veg. Scand. (1846) 182, 4.—**lc.**: Perf. Fl. Sev. Kr. 107, Gmel. Fl. sib. IV, t. 70.—**Exs.**: GRF No. 1222.

Perennial. Rhizome creeping. Basal leaves long-petiolate, broadly deltoid, cordate, 15–20 cm long and up to 20 cm wide, deeply sinuate, with coarse acute teeth up to 3–4 cm long and broadly deltoid, in turn divided into unequal, acute small teeth. Leaves grayish-tomentose beneath, glabrous above, younger leaves arachnoid-hairy. Stems 10–40 cm high, up to 70 cm at fruiting, with amplexicaul leafy petioles, lower leaves ovate-lanceolate, upper lanceolate, acuminate, sometimes
649 with vestigial lamina. Inflorescence long, spicate; capitula 1.5 cm in dia, on long peduncles elongating after flowering. Florets bright white or pink; staminate capitula with one whorl of peripheral ligulate florets, with 4–6 mm long ligule, projecting above involucre, much shorter in pistillate capitula. Style much longer than corolla, not thickened below stigma, stigma bilobed with oblong, pubescent lobes. Achenes smooth, a fourth to a third as long as pappus, pappus consisting of many simple hairs. Flowering May to June, beginning July.

Peat bogs of north of forest region and mountains of Siberia.—*European part*: Karelia-Lapland, Dvina-Pechora, Volga-Kama; *Western Siberia*: Ob River Area, Irtysh (east), Altai; *Eastern Siberia*: Angara-Sayans, Dauria, Lena-Kolyma, Kamchatka (occasionally). *General distribution*: Scandinavia, Mongolia (north), North America. Described from Siberia from Gmelin's material. Type in Leningrad.

Note. Ledebour (op. cit.) treated the Kola tundra plants under the name *N. frigida* β., distinguishing them from the usual *N. frigida* that grows in the marshes of the forest zone. The material in our hands, from the arctic and tundra regions of the Soviet Union, is, in fact, somewhat different from the forest and montane Siberian material.

Tussilago frigida, described by Linnaeus (*Sp. pl.* 1753, 865), was characterized already earlier in the flora of Lapland (*Fl. Lapp.* 1737, 303) as the plants growing in the lowlands of the Lapland alpine region and in the bordering forests with deltoid leaves and acute apices but with undulate-acuminate margins with 7–8 teeth.

Thus, the Linnaean name *T. frigida* must be applied to the arctic and tundra circumpolar species; the plants from the forest zone with toothed leaves having coarse and acute teeth should be called *N. angulosa* Cass.

4. **N. frigida** (L.) Hook. Fl. bor. I (1833) 307 quoad nom.; DC. Prodr. V, 205.—*Nardosmia frigida* β. Ldb. Fl. Ross. II (1844–1846) 467.—*N. frigida* auct.: Perf. Fl. Sev. Kr. 360, pro parte; Kryl. Fl. Zap.

Sib. XI, 2823, pro parte; Popov, Fl. Sr. Sib. II, 740, pro parte.—*Tussilago frigida* L. Sp. pl. (1753) 865.—*T. corymbosa* R. Br. in Suppl. to Parry's first Voyage (1824) CCLXXIX.—**Exs.:** Herb. norm. Nos. 5286, 5285.—**lc.:** Hultén, Fl. Al. and Yukon, X, 1580, fig. 3a, b, c, f.

Perennial. Rhizome creeping. Basal leaves petiolate, with 3–4 cm long petiole, deltoid or oblong deltoid, 3–6 cm long and 3–4(6) cm wide, cordate, with acute teeth, in typical with 7–8 coarse, obtuse, deltoid teeth, glabrous above, white-tomentose beneath. Stems 10–20 cm long, with leafy petioles, lower leaves ovate-lanceolate, upper lanceolate, 1–2 cm and 2–4 cm long, acuminate, often with vestigial lamina. Inflorescence corymbose (and not spicate), somewhat lax at
650 fruiting; capitula on longer peduncles; florets reddish, 1.5 cm wide; structure of florets and achenes as in previous species. Flowering end of July, August.

Marshy tundras, along banks of rivers and streams.—*Arctic:* Arctic Europe, Novaya Zemlya, Arctic Siberia, Chukotka, Anadyr; *Far East:* Kamchatka, Okhotsk. *General distribution:* Arctic, Scandinavia (northern part), North America (arctic region). Described from high altitudes of Lapland. Type in London.

Note. Typical *N. frigida* grows on the Kola Peninsula along the coast of the Barents Sea, on the islands of the Arctic Ocean and on Novaya Zemlya, the Polar Urals and the Yamal Peninsula. Plants found to the east of the Yamal relegated by me to this species are somewhat different with respect to the cutting of the lamina, but have a similar corymbose inflorescence. Similar plants from North America were named *N. corymbosa* by Ledebour (*Fl. Ross.* II, 467, 468). These plants are hybrids between the amphi-Pacific species *N. palmata*, occurring in America and Asia, and the circumpolar species *N. frigida*. Typical *N. palmata* is not found in the range of the hybrids. Thus, these hybrid forms could be considered a separate species of hybrid origin. It appears, however, that these plants are extremely polymorphic to the extent that Rydberg (Rydb. in *North. Am. Fl.*, 34, 1927, 311–115[sic.]) has described several species from the North American material alone. In the *Flora of Alaska and Yukon* Hultén ignores Rydberg's species, listing some of them as synonyms of the hybrid forms, and accepts only one species, *Petasites hyperboreus* Rydb., which, apparently, is also one of the extreme hybrid forms between *N. palmata* and *N. frigida*.

Series 3. *Laevigatae* Kuprian.—Leaves deltoid- reniform, glabrous on both sides; florets yellow. A monotypic series.

5. *N. laevigata* (Willd.) DC. Prodr. V (1836) 205, submascula, pro parte; Ldb. Fl. Ross. II, 467; Perf. Fl. Sev. Kr. 360; Krascheninn. Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 364; Kryl. Fl. Zap. Sib. XI, 282; Bobrov in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX, 18.—*Tussilago laevigata* Willd. Sp. pl. III, 3 (1804) 1969.—*Petasites laevigatus* (Willd.) Rchb. Fl. Germ. exs. (1830) 279, quoad nomen. pl. germ. excl.—*N. straminea* Cass. in Dict. Sc. Nat. XXXIV (1825) 189.—**Ic.:** Ldb. Ic. Fl. Ross. IV, tab. 341; Geml. Fl. sib. II, t. 69.—Exs.: GRF No. 2024.

Perennial. Rhizome thick, 0.5–1.0 cm thick, long. Basal leaves long-petiolate, with bluish-violet, 20–35(55) cm-long petioles, lamina deltoid-reniform, short-acuminate, broadly sinuate-toothed, cordate, glabrous on both sides, coriaceous, 10–25(35) cm wide and 5–20 cm long. Stems 15–60 cm high, arachnoid-hairy above. Cauline leaves ovate-lanceolate, 3–8 cm long, glabrous. Capitula in corymbose inflorescence, 7–10(15). Florets yellow or yellowish. Peripheral
651 pistillate florets ligulate, one-whorled; corollas of staminate florets infundibuliform, 5–6 mm long, their styles almost as long as corolla, pubescent below stigma, with inconspicuous thickening, also pubescent; stigma bilobed, lobes oblong. Involucral bracts lanceolate 6 mm long and 2 mm wide in middle. Achenes smooth, about 3 mm long. Flowering April to June.

Gravelly banks of rivers and mountain streambeds, on shoals and abundant in the water.—*Arctic:* Arctic Europe, Arctic Siberia (Polar Urals); *European part:* Karelia-Lapland, Dvina-Pechora, Volga-Kama (middle and southern Urals); *Western Siberia:* Ob River Area, Altai; *Eastern Siberia:* Yenisei, Angara-Sayans, Dauria. Endemic. Described from Lake Baikal Region. Type specimen—Plate 69 in the *Flora Sibiri* [Flora of Siberia] by Gmelin.

Section 2. Brevilobae Kuprian.—Style of tubular-infundibuliform florets thickened below stigma and with a ring; stigma lobes short, lanceolate or ovate, 0.3–0.5 mm long.

Type of section: *N. palmata* (Ait.) Hook.

Series 4. Palmatae Kuprian.—Leaves divided into 7–8 broadly cuneate lobes, in turn divided into acute lobules in turn with unequal, coarse and sharp teeth; florets violet or white. Several North American species, somewhat resembling *N. palmata*, are included in this series: *N. arctica* (Porsild) Kuprian. comb. n. h. 1., *N. speciosa* Nutt. and others.

6. **N. palmata** (Ait.) Hook. Fl. Bor. am. I (1835) 308; DC. Prodr. V, 206.—*Tusillago palmata* Ait. Hort. kew. III (1789) 188, t. 11.—*Petasites palmata* A. Gray in Bot. Calif. I (1876) 407; Kom. and Alis. Opređ. Rast. Dalnevost. Kr. II, 1043.—*Petasites tatwakianus* Kitamura in Acta Phyt. et Geobot. IX (1940) 64.

Perennial. Rhizome thick, creeping, about 1 cm thick. Basal leaves with petioles 15–40 cm long, almost round or roundish-reniform, cordate, 15–60 cm wide, palmately dissected almost up to half, 7–8 broadly cuneate lobes, usually trifid into acute lobes in turn with unequal, coarse and large sharp teeth, leaves glabrous above, finely white-pubescent beneath. Stems thick, (15)60–100 cm wide at fruiting, with amplexicaul, leafy, ovate-lanceolate petioles, 4–7 cm long and 1.5–4.0 cm wide, with finely tomentose fimbria. Inflorescence more or less corymbose, at fruiting somewhat lax, with elongated peduncles. Florets light violet or white, with pleasant aroma; style of tubular-infundibuliform florets slightly exceeding corolla, with ring below stigma, conically thickened; stigma lobes short, lanceolate, papillate, staminate capitula homogamous or heterogamous, with pistillate ligulate florets. Flowering May to June.

Sandy and stony banks of forest rivers and streams, in groups forming large stands.—*Far East*: Zeya-Bureya, Uda River Area, Sakhalin, Ussuri. *General distribution*: northeastern China, North America from southern Alaska to California. Described from cultivated specimens. Type in London.

Note. Kitamura segregates the Far Eastern plants relegated by the Russian flora specialists to *N. palmata* (Ait.) Hook. from the North American plants, describing them under the name *N. tatewakianus*. The main differences being that in *N. tatewakianus* the leaves are palmately lobed, the ligules of the florets are 1 mm long, and the achenes 3.0–3.5 mm long, whereas in *N. palmata* the leaves are deeply palmately dissected, the corolla is distinctly ligulate, the ligules are up to 5 mm long, and the achenes 2 mm long. At present it is not possible to resolve the question of the separate status of the Far Eastern race because of the great diversity of the North American material and nonavailability to me of the type specimen of the species.

Hybrids of *N. palmata* and *N. japonica* are found.

Series 5. Japonicae Kuprian.—Ligulate florets absent; pistillate florets with infundibuliform, obliquely divided corolla.

7. **N. japonica** S. and Z. Fl. Japon. (1843) 181.—*Petasites giganteus* Fr. Schm. ex Trautv. in Tr. Peterb. Bot. Sada, VIII (1883) 433, non Fuss. 1866.—*P. japonicus* Kitam. Compost. Japon. III (1940)

162.—*P. japonicus* var. *giganteus* Makino in Bot. Mag. Tokyo, 23 (1909) 18; Kitam. Compos. Japon. III, 164.—*P. japonicus* F. Schm. ex Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II (1932) 1043.—*P. amplus* Kitamura in Acta Phyt. et Geobot. I (1932) 115.

Perennial. Rhizome 1.0–1.5 cm thick, in upper part tuberculate, up to 2.0–2.5 cm thick. Basal leaves long-petiolate, petioles up to 2 cm long, very large, (30)60 cm–1.5 m wide, reniform, with small teeth, dark green and almost glabrous above, light colored beneath, particularly younger leaves covered on both sides with short, white, arachnoid-hairy pubescence. Stems (15)60 cm high, strongly elongated at fruiting, covered with short, thick hairs. Cauline leaves amplexicaul, oblong-lanceolate to broadly ovate, (2)5–8 cm long and 1.5–5.0 cm wide, acuminate, covered with very short, thickish hairs, narrower in fertile individuals than in sterile. Capitula conical, 1.0–1.5 cm in dia, 20–30, in corymbose inflorescence; florets white, tubular, hermaphrodite; sterile capitula with only staminate florets having infundibuliform corolla; pistillate capitula heterogamous; corolla of pistillate florets obliquely cut, 10 mm long, style much exceeding corolla, cylindrically thickened below stigma, with ring, stigma short-bilobed, lobes ovate, acuminate, papillate. Involucral bracts broadly lanceolate, membranous, with prominent veins. Achenes smooth, a fourth to a third as long as pappus. Flowering May; fruiting June.

North facing slopes of conical hills, on riverbanks, gravel beds.—*Far East*: Sakhalin (and Kuril Islands). *General distribution*: Northern Japan. Described from Japan. Type in Florence.

653 **Note.** *Petasites amplus* Kitamura apparently is very similar to *N. japonica* S. and Z. and is distinguished by larger basal leaves, with the lamina up to 1.5 m wide and having an almost smooth margin with only fine acuminate teeth.

The leaves of *N. japonica* S. and Z. are extraordinarily similar to the European *Petasites albus*. There is no need for the name *P. amplus* Kitamura since the epithet "*gigantea*" was not used in the genus *Nardosmia*.

If it were proved that this plant should be recognized, then it would have to be called *N. gigantea* (Fr. Schmidt).

Kitamura described *Petasites himalaicus* Kitam. (*Acta Phyt. et Geobot.*, XV, 4, 1954) from Nepal, where this species is found in birch groves at 3,300 m. This species should be referred to the genus *Nardosmia* and called *N. himalaica* (Kitam.).

Subgenus 2. Endocellion (Turcz. ex Herd.) Kuprian. comb. n.—*Endocellion* Turcz. ex Herb. in Bull. Soc. Nat. Mosc. XXXVIII (1865) 375.—Small plants with solitary capitula or less often, in pistillate

specimens, with 2–3 capitula; stigma of central tubular-infundibuliform florets hairy, stigma lobes linear. Plants of mountain tundra and tundra plains.

Type of subgenus: *Nardosmia gmelini* Turcz. ex DC.

8. **N. gmelini** Turcz. ex DC. Prodr. VII (1838) 271; Ldb. Fl. Ross. II, 2, 466.—*Tussilago gmelini* Turcz. in Herb. (1835).—*Hardosmia populifolia* (Smith) Schischk. in Fl. Zap. Sib. XI (1949) 2826, non *Perdicium populifolium* Smith in Rees, Cycl. XXVI (1819) No. 4.—*Endocellion boreale* Turcz. ex Herd. in Bull. Soc. Nat. Mosc. XXXVIII (1865) 375.—*Petasites gmelini* (Turcz. ex DC.) Polunin in Rhodora, LIII (1951) 288.—**lc.**: Gmel. Fl. sib. II (1749) 141, t. 67, fig. 1.

Perennial. Rhizome slender, 2–3 mm thick. Basal leaves with 2–5 cm long petioles, oval, cuneate at base, 2–4 cm long and 0.5–1.5 cm wide, weakly sinuate-toothed or entire, glabrous above; white tomentose beneath. Stems 10–30 cm high. Cauline leaves 0.7–3 cm long, brownish-violet. Capitula solitary or 2–3 about 2 cm in dia. Involucral bracts oblong, violet, acuminate, white-arachnoid-hairy. Pistillate capitula 2–3, fertile, with numerous florets, 2–3 peripheral whorls with 8.0–8.5 mm-long ligules; style of ligulate florets with short, bilobed stigma, stigma lobes ovate; florets of inner whorls with shorter ligules; florets in center of capitulum campanulate, small, style of central florets with oblong pubescent-hairy and almost up to base bifid stigma. Achenes 3–4 mm long, smooth, cylindrical, with indistinct ribs; pappus 2.5 times as long as achene. Flowering June to July.

Rubby tundra in montane regions and on plains.—**Arctic**: Arctic Siberia (Polar Urals, Taimyr, Vitim Plateau); Chukotka, Anadyr; **Eastern Siberia**: 654 Angara-Sayans, Dauria; **Far East**: Okhotsk. **General distribution**: Mongolia (north). Described from Gmelin's material. Type—Plate 67, Fig. 1 in the "*Flora Sibiri*" [Flora of Siberia] by Gmelin.

9. **N. glacialis** Ldb. Fl. Ross. II, 2 (1844–1846) 466; Herd. in Bull. Soc. Nat. Mosc. XXXVIII, 370.—*N. billingsiana* Fisch. ex Herd. l. c. nomen.—*Petasites glaciales* (Ldb.) Polunin in Rhodora, LII (1951) 228.

Perennial. Rhizome slender, 2 mm thick, long. Basal leaves with 1–5 cm long petiole, deltoid, 2–3 cm wide, glabrous on both sides, somewhat cordate, with coarse and unequal teeth, teeth broadly deltoid, acuminate, 0.5–1.0 cm at base, 0.5–1.0 cm long. Stems slender, 10–20 cm high, younger stems white-arachnoid hairy above. Cauline leaves lanceolate, upper smaller, linear-lanceolate, with narrow, white-tomentose, fimbria. Capitula solitary terminal, 10–12 mm in dia. Involucral bracts lanceolate, acuminate, at base densely crisped hairy.

Central florets tubular-infundibuliform, with oblong, hairy stigma 1 mm long, bifid almost to base. Peripheral florets pistillate, ligulate, ligule ovate, apically slightly sinuate, 3–4 mm long, in one whorl; stigma of pistillate florets undivided, slightly thickened, short-papillate. Pappus 2.5 times as long as achene; achenes terete, smooth, about 2 mm long. Flowering July to August.

Dry stony slopes and in tundra.—*Arctic*: Arctic Siberia (to east of Taimyr), Chukotka, Okhotsk. Endemic. Described from Arctic Siberia. Type specimen apparently lost.

Note. In restoring *Endocellion* Turcz. ex Herd. to the rank of genus, the name *Endocellion glaciale* (Edb.) should be accepted for this species.

GENUS 1557. *Homogyne* Cass.^{1, 2}

Cass. in Bull. Soc. Philom. (1816) 198; DC. Prodr. V (1836) 204.

Capitula cylindrical, solitary. Involucral bracts in one row, linear-lanceolate. Florets heterogamous; central florets bisexual, fertile, with tubular, 5-lobed corolla; peripheral florets pistillate, with longer corolla, their stigmas of same shape as in bisexual florets. Achenes cylindrical, 655 somewhat ribbed; pappus narrowed, its bristles simple. Perennial herbs with reniform toothed or lacerate wintering leaves.

Of the three species found in Western Europe, we have one.

1. *H. alpina* (L.) Cass. in Bull. Soc. Philom. (1816) 198; DC. Prodr. V, 205; Szaf. Kulcz. Pawl. Roslin. Polsk. 632; Vizn. Rosl. USSR, 552; Hegi, Ill. Fl. VI, 696, fig. 410.—*Tussilago alpina* L. Sp. pl. (1753) 865.

Perennial. Rhizome branched, creeping, slender, 1.5–2.0 mm thick. Basal leaves petiolate, 2–4 cm long, roundish-reniform, 1.5–5.0 cm wide, sinuate-toothed, teeth broadly deltoid, with short apex, petioles as well as leaves, particularly along veins, covered with thick, ochreous hairs. Stems 10–20(40) cm high, densely hairy, particularly younger stems, with similar hairs. Cauline leaves few, the lower amplexicaul, broadly ovate, upper narrowly lanceolate. Capitula solitary; involucral bracts in single row, linear-lanceolate; florets lilac. Achenes 5 mm long, somewhat ribbed, half as long as pappus. Flowering April to May; fruiting June.

¹Treatment by L.A. Kuprianova.

²From the Greek words. *omos*—equal, identical, and *gyne*—wife, women; the stigma of the pistillate (female) florets is of the same shape as in the bisexual florets.

Alpine and subalpine mountain zones and in bordering forests.—*European Part*: Upper Dniester. *General distribution*: mountains of Central and Southern Europe. Described from Western Europe. Type in London.

GENUS 1558. *Arnica* L.^{1, 2}

L. Sp. pl. (1753) 884; Maguire, Monogr. gen. Arn. in Brittonia, IV, 3 (1943).

Capitula solitary or few; involucre 2-rowed, with herbaceous, more or less equal involucral bracts, very rarely one-rowed, receptacle convex, covered with hairs or cilia. Peripheral florets ligulate, pistillate, with yellow or orange ligules; other florets tubular, bisexual, yellow or orange, often pale in lower part, with 3 teeth; anthers almost as long as filaments, mostly yellow, less often dark purple; style with slender, stigma distinctly exerted from corolla, grooved inside, papillate outside, apically extending almost into raceme. Pappus consisting of many bristles or short- to long-barbate, less often almost pinnate, white, slightly pinkish, or dull, as long as tubular corolla or slightly longer. Achenes linear-terete, mostly slightly narrowed toward both ends, with longitudinal ribs, basally always with a white ring, glabrous, setose-hairy or even glandular. Plants herbaceous, with opposite leaves, less often only upper pair obliquely opposite or alternate. In all, the genus includes 12 species.

656 Type of genus: *A. montana* L.

1. Anthers purple or blackish-violet (when dry); pappus sordid or straw-colored (Subgenus III. *Andro-purpurea* Maguire) 2.
- + Anthers yellow; pappus white, somewhat pinkish, less often straw-colored 4.
2. Corolla tube glabrous or only with occasional, very sparse hairs, abruptly broadened into limb almost as long as tube 7. *A. unalaschcensis* Less.
- + Corolla gradually attenuate into tube, shorter than limb, with scattered or denser, upright hairs 3.
3. Plants tall, up to 100 cm high, glabrous, hairy only at stem apex below capitula, with 12–20 pairs of somewhat thick leaves; capitula always erect, pappus straw-yellow 8. *A. sachalinensis* (Rgl.) A. Gray

¹Treatment by M.M. Iljin.

²From the Greek word *arnicos*—sheepskin, or *arnos*—sheep.

- + Plants low, with more or less hairy stems, lacking leaves or only with 1–4 pairs of cauline leaves; capitula always drooping; pappus dull 6. **A. lessingii** Green
- 4. Basal leaves wide, ovate, oval, or oblong-oval, mostly subobtusely, sessile or subsessile; hairs in upper part of stem simple and glandular; pappus straw-colored. Plants of forest regions in western European part of USSR (Subgenus II. *Montana* Maguire) 5. **A. montana** L.
- + Basal leaves narrower, subacute or acuminate, distinctly narrowed into petioles; hairs in upper part of stem similar or only simple; pappus white or with scarcely noticeable pinkish shade. Arctic and subarctic plants of Siberia and far north of European part of USSR (Subgenus I. *Arctica* Maguire) 5.
- 5. Plants with only simple hairs 6.
- + Plants with simple and glandular hairs 7.
- 6. Basal leaves narrow, lanceolate or linear-lanceolate, entire, acuminate, sparsely hairy beneath. Kola Peninsula 1. **A. alpina** (L.) Olin and Ladau
- + Basal leaves lobed, oval or oblong-oval, obtuse or subacute, remotely toothed in upper part, glabrous or subglabrous beneath, usually glaucescent. Plants of Chukotka Peninsula 4. **A. frigida** C.A.M. ex Iljin
- 7. Stem densely tomentose below capitulum covering most of the glandular hairs; corolla of ligulate florets usually dark yellow. Plant of Okhotsk District 3. **A. intermedia** Turcz.
- 657 + Glandular hairs at top of stem very visible under hand lens; corolla of ligulate florets light yellow. Plant of far northeast of European part of USSR and Siberia 2. **A. iljinii** (Maguire) Iljin.

Subgenus 1. **Arctica** Maguire. Monograph. gen. Arn. (1943) 406.—Anthers yellow; pappus white; leaves narrow. Plants of the Arctic.

1. **A. alpina** (L.) Olin and Ladau, Dissert. de Arnica, Upsaliae (1799) 11; Murr. in Sv. Vet.-akad. Nandl. 337; Iljin in Tr. Bot. Muz. Akad. Nauk SSSR, XIX, 112.—*A. montana alpina* L. Sp. pl. (1753) 884; Fedtsch. and Fler. Fl. Evrop. Ross. 988 p. p.—*A. alpina* (L.) Olin subsp. *genuina* Maguire Monogra. gen. Arn. (1943) 408.—*A. angustifolia* DC. Prodr. VI (1937) 317 p. p. non Vahl.—**lc.**: Iljin, op. cit.; Maguire, loc. cit. f. 26; fig. 27; Svensk. Bot. X, t. 699.—**Exs.**: Pl. Fin. exs. No. 1394.

Perennial. Plant 10–25(30) cm high, with simple, usually solitary stem, hairy almost from base, more densely near capitula, with simple hairs (glandular hairs absent). Cauline leaves 1–3(4) pairs, broadly to

narrowly lanceolate, entire, acuminate, sessile; basal leaves mostly smaller, sometimes only acute or even almost subobtusely, and more tapering toward base in short winged petiole; all leaves on both sides sparsely covered with long hairs, 5–10 cm long and 5–10 cm wide, with 3–5 parallel veins. Capitulum solitary, campanulate, 1.5–2.0 cm long and 2.5–3.0 cm in dia when mature. Involucre and stem apex densely whitish-pubescent-hairy from simple hairs, with occasional, indistinct, very short, stalked glands under hair cover; involucre bracts 12–20, lanceolate, acuminate, dark green, usually sordid purple in upper part, 10–13 mm long and 1.5–2.5 mm wide. Florets pale-yellow, ligulate, 10–15, with oblong-linear ligules, 4–7 mm wide, 15–30 mm long, mostly with 7–10 dark yellow veins, with occasional sparse hairs, often glabrous above, subglabrous on inner (ventral) side, apically with 3–4(5), oblong-deltoid teeth; tubular florets 6–9 mm long, almost as long as pappus, densely hairy in lower part like base of ligulate. Achenes 4–7 mm long, oblong, densely covered with long, upright, simple hairs. Flowering July to August; fruiting August to September.

Meadows of alpine and subalpine mountain zones.—*Arctic*: Arctic Europe; *European Part*: Karelia-Lapland (only on Kola Peninsula). *General distribution*: Scandinavia (Lapland). Type in London.

Note. In the herbarium of the Botanical Institute of the Academy of Sciences of the USSR, there is an indisputable specimen of this species from the Altai, from the vicinity of Riddersk. It can be presumed that there is some error in the labeling, particularly since this report has not been confirmed. It would be more likely to expect to find the north Siberian species *A. iljinii* (Maguire) Iljin in the Altai.

Economic Importance. Chirikh (1917) mentions that this species is also sometimes referred to as *A. montana* L. The value of this species as a medicinal plant is reported by Hocking (1944) also. It is possible that both the rest of the arnica species similar to *A. alpina* (L.) Olin and Ladau and of the other subgenera may have similar medicinal properties.

2. *A. iljinii* (Maguire) Iljin comb. nova.—*A. alpina* subsp. *iljinii* Maguire Monogr. gen. Arn. (1943) 411.—*A. angustifolia* Iljin in Tr. Bot. Muz. Akad. Nauk SSSR, XIX (1926) 110, non Vahl; Kryl. Fl. Zap. Sib. XI, 2833, non Vahl.—*A. montana* β. *stenophylla* Ldb. Fl. Ross. II (1844) 622 p. p. (excl. specim. Alach-Jun.).—*A. alpina* auct. siber. non Olin; Fedtsch. and Fler. Fl. Evrop. Ross. 988 p. p.—**lc.**: Maguire, loc. cit., fig. 26, f. 27; Iljin, loc. cit. X, Fig. 2.

Perennial. Plant 10–50 cm high, with slender, creeping, 1–3 mm-thick brownish rhizome, densely covered with appressed, flat, entire or strongly divided scales, densely covered under scales in its upper part with long, whitish hairs gradually decreasing downward and vanishing.

Stem solitary or few, erect or weakly ascending, at base often dirty purple, more often simple, sometimes with short flowering branches or even long branches, pubescent, with sparser simple hairs and subsessile glands below, more densely hairy below capitulum and at base of involucre, simple, long, somewhat entangled hairs mixed with very numerous, multi-cellular glandular hairs that are shorter than simple hairs. Basal leaves few pairs, lowermost leaves shorter, often withering before flowering, others longer, oblong-oval to broadly or narrowly lanceolate, narrowed toward base into broad petiole, like cauline leaves entire, less often with occasional teeth and short cilia along margin, acuminate, with 3–5(7) veins, on both sides with scattered simple hairs and denser, subsessile glands, less numerous above, 5–20 cm long including petiole, 0.5–3.0 cm wide; cauline leaves 1–3 pairs, reduced upward, much narrower, lower leaves with short winged petiole, others narrowed toward base but sessile, borne in lower part of stem. Capitula solitary or few at apices of stem and branches, 2–6 cm in dia at flowering, involucre campanulate, 10–15 mm long; involucre bracts lanceolate, acuminate, usually reddish-violet in upper part or entirely, (12)14–18(20), with simple hairs and sessile (or subsessile) glands. Ligulate florets light yellow; ligule, 12–25 mm long and 3–10 mm 659 wide, 7–9 veined, with 3 teeth at apex and even 3-fid, glabrous on both sides with short tube covered with simple upright hairs; tubular florets (6)7–9(10) mm long, yellow, almost as long as pappus, with limb covered with simple upright hairs, sometimes extending into base of expanded part of tube, glabrous in remaining part with short hairy teeth. Pappus white, serrate-barbed; achenes linear, 4–6 mm long, dark gray, very finely and closely, longitudinally ribbed, covered with simple upright hairs. Flowering second half of June to first half of August; fruiting second half of July to September.

Tundra and forest-tundra as well as alpine region, northern taiga region, on stony slopes, rocks, clay and limestone outcrops, gravelly and sandy shoals of rivers, in grassy and lichen-moss tundras, meadows, forest glades willow thickets, open taiga forests, etc.—*Arctic*: Arctic Europe (except Kola Peninsula), Novaya Zemlya, Arctic Siberia, Anadyr; *European part*: Dvina-Pechora (north); *Western Siberia*: Ob River Area (north), Yenisei (north); *Eastern Siberia*: Lena-Kolyma (north). Endemic. Described from Ust-Yenisei Port (69°39' N. Lat.). Type in Leningrad.

3. **A. intermedia** Turcz. in Bull. Soc. Nat. Mosc. XXIV (1851) 203; Iljin in Tr. Bot. Muz. Akad. Nauk SSSR, XIX, 111.—*A. montana* β. *stenophylla* Ldb. Fl. Ross. II (1844) 622, p. p.—*A. angustifolia* DC. (non Vahl) Prodr. VI, 317 p. p., *A. alpina* subsp. *intermedia* (Turcz.)

Maguire, Monogr. gen. Arn. (1943).—**lc.**: Iljin, loc. cit. Plate X, la and b.

Perennial. Plant 10–30 cm high, stem mostly simple solitary or few, erect or weakly ascending, hairy from base, particularly densely hairy-villous below capitulum with long, divergent, simple hairs and shorter glands, more or less sparse, concealed under densely woolly cover at stem apex and base of involucre, also dense and long-villous. Basal leaves few, narrowly lanceolate to oblong-lanceolate, narrowed toward base, acuminate or acute, with 3–7 veins, on both sides with long, sparse or dense, semiappressed hairs, sometimes with very short, remote teeth; cauline leaves sessile, usually narrower, 1–2(3) pairs, often with undeveloped short pedunculate capitula in their axils. Capitula 4–5 cm in dia when open. Involucre 12–15 mm long; involucre bracts (13)15–20(23), mostly oval-lanceolate, sub-acute, often with sordid purple shade, with dense entangled hairs, in lower part, concealing glands, sparsely glandular in upper half with sessile glands, long-ciliate-hairy only along margin, but apically with a tuft of hairs, sometimes with similar hairs, somewhat below and on dorsal side among glands, glabrous on inner side. Ray florets usually dark yellow when
 660 dry, ligulate, 15–18, ligule mostly 15–20 mm long and 3–6 mm wide, with 7–11 longitudinal veins, apically with 3 teeth, less often 3-fid, glabrous on inner side, sparsely hairy in lower part on outer side, abruptly terminating into short tube, mostly 3–4 mm long, covered with obliquely upright hairs; tubular florets about 6 mm long, with erect hairs in lower half, glabrous above. Pappus serrate or scarcely serrate-barbate, 8–9 mm long, longer than tubular florets and tube of ligulate florets; achenes oblong, 4.5–5.0 mm long, brownish, densely covered with semiappressed and obliquely upright, simple, long hairs. Flowering July; fruiting August(?).

Eastern Siberia: Lena-Kolyma (Aldan, Allakh-Yun); *Far East*: Okhotsk. Endemic. Described from Allakh-Yun. Type in Leningrad.

4. **A. frigida** C.A.M. ex Iljin in Tr. Bot. Muz. Akad. Nauk SSSR, XIX (1926) 112; Kom. Vved. v Izuch. Rast. Yakutii, 1, 162.—*A. alpina* Less. in Linnaea, VI (1831), 235 (non Olin and Ladau); Herder in Bull. Soc. Nat. Mosc. XL, 1, 423; Ldb. Fl. Ross. II, 623.—*A. lessingii* Trautv. ex Iljin, op. cit. 112, non Greene.—*A. angustifolia* Vahl. β . *lessingii* Torr. and Gray, Fl. North Amer. II (1843) 449.—*A. louseana* Farr. subsp. *frigida* (C.A.M. ex Iljin) Maguire in Madrono, VI (1942) 153 and in Monogr. Gen. Arn. (1943) 417.—**lc.**: Iljin, loc. cit., Plate XI, Fig. 3a and 3b.

Perennial. Plant 5–30 cm high, with short, glabrous rhizome, densely covered with brownish remnants of leaves. Stems single or



Plate XXXII.

Habit, tubular floret, corolla of tubular floret.

1 — *A. lessingii* Greene; 2 — *A. unalaschcensis* Less.; 3 — *A. sachalinensis* Gray.

few, simple, very rarely with 1–2 branches, usually reddish-purple at base or in lower half, densely hairy throughout, particularly densely below capitula, with long, simple, multi-cellular hairs (uppermost cell filiform), lacking glandular hairs and simple glands, with 1–3 pairs of leaves, less often even leafless. Leaves of basal rosette lobate, oblong-oval or oval, mostly short-petiolate, less often petioles longer but always shorter than lamina, lamina obtuse or acute, with remote teeth mainly in upper part, like petioles ciliate-hairy, with sparse or occasional hairs above, mostly glaucescent and glabrous beneath or sometimes with occasional hairs, particularly on midrib; cauline leaves narrower, lanceolate or linear, entire, sessile, usually more densely pubescent; uppermost leaves often obliquely opposite or even alternate. Capitula solitary, very rarely 2–3 at apices of branches, (2)3.5–5.0 cm in dia. Involucre (10)12–14 mm long, densely pubescent in lower part, usually
 663 very sparsely above, purple entirely or only along margin and midrib; involucre bracts linear or lanceolate, acuminate, (2)2.5–3.0 mm wide, usually 12–16. Ligulate florets (9)10–15, light yellow, with (5)7–10 veins, with 3 teeth or almost 3-fid, ligule (15)17–23 mm and 3–5 mm long limb, usually densely hairy with simple, long hairs on short unicellular base, ligule 3–5 mm wide; tubular florets 6–9 mm long, tube shorter than limb and densely covered with erect hairs as in ligulate florets, with teeth often barbate and short-hairy. Pappus as long as tubular florets or slightly longer than it and limb of ligulate florets, silvery white, usually with scarcely noticeable pinkish shade, short-barbate; achenes linear, 4–6 mm long, blackish-gray or dark brown, with sparse, often occasional, obliquely upright hairs, much longer in upper part, often becoming glabrous. Flowering July to August; fruiting July to September (?).

In dry lichen, meadow, rubbly and stony tundras as well as on gravel beds, rocks, sand bars in river valleys, coastal bluffs and along the coast of Arctic Ocean in tundra zone.—*Arctic*: Arctic Siberia, Chukotka, Anadyr; *Eastern Siberia*: Lena-Kolyma. *General distribution*: North America (islands in Bering Strait and Alaska). Described from Gulf of Northern Laurentia and Gulf of Eschscholtz. Type in Leningrad.

Note. The species was first established under this name by Trautvetter, but he did not publish a description. Iljin, in *Tr. Bot. Muz. Akad. Nauk SSSR*, XIX, 1926, pp. 112 and 116–117.

Subgenus 2. Montana Maguire Monogr. Gen. Arn. (1943) 483.—Anthers yellow; pappus straw-yellow; leaves in rosette wide. Plants mostly of forest and mountain-forest zones.

5. **A. montana** L. Sp. pl. (1753) 884; DC. Prodr. VI, 317; Maguire, op. cit. 485; Iljin in Tr. Bot. Muz. Akad. Nauk SSSR, XIX, 110; Ldb. Fl. Ross. II, 622 (excl. specim. Ekaterinenburgensis and *β. stenophylla*; Fedtsch. and Fler. Fl. Evrop. Ross. 487.—*A. plantaginifolio* Gilib. Fl. Lith. III (1782) 210.—*A. alpina* Willd. ex Steud. Nom. ed. 1 (1821) 70 non Olin.—*A. helvetica* G. Don. ex Loud hort. Brit. (1830) 351.—*Doronicum montanum* Lam. Encycl. meth. II (1790) 312.—*D. arnica* Desf. Cat. h. paris. ed. 1 (1804) 101.—*D. oppositifolium* Lam. op. cit. p. 312.—**lc.**: Maguire, loc. cit. fig. 94, No. 95; Iljin op. cit. X, 3; Rchb. Ic. Fl. Germ. XVI, t. 958; Hegi, Ill. Fl. VI, 2, f. 414–418; Kom. Lekarstv. Rast. SSSR, IV; Zemlinskii, Lekarstv. Rast. 57.—**Exs.**: Fl. Polon. exs. No. 178; Fl. exs. reipubl. Bohem.-Sloven. No. 287; Fl. Hungar. exs. No. 589; Hayek, Fl. stir. exs. Nos. 1270, 1271.

Perennial. Plant 15–80 cm high, simple or branched. Rhizome short; stem erect, with simple and glandular hairs, particularly dense in upper part, with rosette of leaves at base and 1–2, less often 3 pairs of cauline leaves. Leaves of basal rosette broad, oval or oblong-oval, entire, subobtuse, with prominent lateral veins, sparsely hairy above, mostly glabrous beneath or only along vein weakly hairy, short-petiolate or subsessile; cauline leaves oblong or lanceolate, less often oblong-oval (lower pair), in upper half of stem, particularly on branches, with only few alternate, linear, acuminate leaves. Capitula solitary at apices of stem and branches, hemispherical, 1(2)–3(5) cm in dia. Involucre of 22(26) lanceolate, subacute involucre bracts with anthocyanin color, 14(12)–17 mm long and 2–5 mm wide, with simple, longish and often glandular hairs on out side, along margin and at apices hairy-ciliate. Ligulate florets yellow, usually 11–15, ligules with 3 (less often 2–4) teeth, tube usually long, pubescent, almost as long as pappus; tubular florets paler, short-toothed, also with pubescent tube as long as pappus or longer, anthers yellow. Achenes 6–10 mm long, narrowed toward base, with erect, simple, serrate-barbed hairs. Flowering June to August (at higher altitudes July to September); fruiting June to September.

Mainly in pine groves and pine-birch forests, in forest glades, clearings and dry meadows, high-mountain meadows.—*European part*: Baltic Region, Upper Dnieper, Upper Dniester. *General distribution*: Scandinavia, Central Europe, Atlantic Europe, mountains of northern Italy and northern Balkans. Described from Alps and northern Europe. Type in London.

Economic Importance. Not much used in modern allopathic medicine; however, it finds a place in the official pharmacopoeia of the USSR. The flowering capitula and a tincture of them are used for medicinal purposes. In other countries, only an extract of the flowers is used, or the flowers are used as a plaster; sometimes the rhizomes

are used for obtaining tinctures and extracts. It is used internally to stimulate cardiac activity and externally as a lotion and liniment. In homeopathic medicine, it is used as a cardiac tonic and as a preparation to stop bleeding in various traumas. Arnica is widely used in folk medicine against fevers, diarrhea, paralysis, epilepsy and other nervous disorders, internal hemorrhages, as a diaphoretic, and in the form of poultices for contusions. The rhizome contains a significant quantity of tannins; according to M. Rylov (1894), up to 32%. According to V.K. Varlikh (1901) and N. Ya. Demyanov, V.I. Nilov, and V.V. Williams (1933), moreover, it contains a bitter substance—arnicin, resins, wax, gum, as well as 0.5 to 1.5% essential oils on a dry weight basis. According to the latter authors, the physical properties of these oils are as follows: 1) specific gravity, calculated in relation to the density of water at 15°C=0.982 to 1.000; 2) refractive index of yellow light at 20°C=1.507 to 1.508; 3) pH=4 to 10; 4) ester number=60 to 100; 5) dissolves in 7–12 volumes of 80% alcohol. This oil contains:
 665 hexycapronate, caproic, formic and isobutyric acids, phlorol (ethylphenol), phloraisobutyric ester, thymohydroxynonmethyl ester and phloromethyl ester. According to V.K. Varlikh, the dry flowers contain 0.1–0.9% essential oil, fats, wax, resins, yellow pigments (apparently carotenoids), tannins, proteins, gums, mineral salts and arnicin. According to the above-cited three authors, fresh flowers contain 0.04–0.07% essential oil with the following physical constants: 1) specific gravity in relation to the density of water at 15°C=0.8905 to 0.9029; 2) melting point =20–30°C; 3) acid number=62.6 to 127; 4) ester number=22.7 to 32.2; 5) does not dissolve well in alcohol. This oil contains lauric and palmitic acids and palmitine. According to Wömer, the rhizome contains up to 9%, and according to Dragendorf 9.7%, inulin, but the flowers, in addition to the above substances, also contain dextrose, crystalline phytosterol-arnidiol or arnisteral and an amorphous substance—arnicin. According to M.M. Glukhov, this species of arnica is a good honey-producing plant.

Subgenus 3. Andropurpurea Maguire, Monogr. Gen. Arn. (1943) 486.—Anthers purple or blackish-violet (when dry); pappus sordid or straw-yellow. Plants of the forest and arctic zones.

6. *A. lessingii* Greene in Pittonia, IV (1900) 167; Iljin in Tr. Bot. Muz. Akad. Nauk SSSR, XIX, 114; Maguire, Monogra. Gen. Arn. (1943) 486; Kom. Fl. Kamch. III, 160; Hulten, Fl. of Kamtsch. IV, 192.—*lc.*: Macquire, loc. cit. fig. 90, fig. 91; Hultén, loc. cit. t. 6, f. e; Iljin, loc. cit. Plate XI, Fig. 4.

Perennial. Plant 6–40 cm high, with slender, reddish-brown, weakly branched or simple, glabrous, rhizome covered with brown leafy scales on remote nodes, crowded only at apex. Stems solitary or few, mostly erect, in basal part more or less ascending, terete, leafless or with 1–3(4) pairs of leaves, covered with multi-cellular, weakly reddish hairs, somewhat longer at places at cellular septa[nodes?], in upper part mostly long-pointed, sparse in lower part of stem, denser above. Basal leaves oval or oblong-oval, lobate, less often only oblong, 3–7(10) cm long and 1–2 cm wide, narrowed into very short petiole, entire or less often with remote teeth, particularly in upper part of lamina; cauline leaves mostly narrowed into narrowly lanceolate, often somewhat obliquely opposite, mostly uppermost leaves toward base also shortly narrowed and extending into short sheath common with opposite leaf; all leaves pubescent-ciliate along margin, glabrous on both sides, less often with occasional hairs, distinctly paler beneath, sometimes hairy along midrib. Capitula solitary, drooping or semi-drooping, with ligulate florets 4.0–5.5(6.0) cm in dia. Involucre broadly campanulate, reddish-purple in lower part, green in upper; involucre bracts lanceolate or less often oblong-ovate, (10)12–15(17), with distinct, but not prominent, midrib and indistinct lateral veins, more or less scattered hairs on outer side as on stem, ciliate, glabrous on inner side. Ligulate florets pale yellow or dark colored, (8)9–13, with 5–9-veined ligules, (14)16.5–22.0 mm long and 2.5–5.0(8.0) mm wide, glabrous and in upper part with 3 glabrous teeth, at base narrowed into 3.5–5.0 mm-long tube covered with sparse and obliquely upright, longish hairs; tubular florets 6–8(9) mm long, gradually narrowed into distinctly shorter tube, also with hairs as in ligulate florets, above with teeth covered with papillae or occasional short hairs; anthers blackish-violet, exerted from tube. Pappus short-barbed, exceeding corolla and almost as long as stigma of tubular florets and much longer than limb of ligulate florets, somewhat sordid; achenes linear, 5–6 mm long, with numerous scabrous ribs, glabrous, grayish or brownish. Flowering July; fruiting August. (Plate XXXII, Fig. 1).

Subalpine and alpine mountain zones.—*Far East*: Kamchatka. *General distribution*: North America (Alaska, Aleutian Islands). Described from Alaska and adjacent islands without their exact designation. Type in Quebec in Notre Dame University.

7. *A. unalaschcensis* Less. in Linnaea, VI (1831) 238; DC. Prodr. VI, 317; Ldb. Fl. Ross. II, 623; Fedtsch. Komand. Ostr. 55; Iljin in Tr. Bot. Muz. Akad. Nauk SSSR, XIX, 117; Hultén, Fl. of Kamtsch. IV, 193; Maguire, Monogr. Gen. Arn. 489.—*A. obtusifolia* Less. in Linnaea, VI (1831) 237; Ldb. op. cit. 623.—*A. langsdorffiana* Fedtsch. in Herb.

Herder in Bull. Soc. Nat. Mosc. XL (1867) 424.—**lc.**: Maguire, op. cit. fig. 96, fig. 97; Iljin, op. cit. Plate XI, Fig. 1.

Perennial. Plant 8–40 cm high, with thick, brown, glabrous rhizome tapered downward, densely covered with remnants of old leaves; stem simple, solitary, sulcate-ribbed, at base weakly ascending, somewhat thick, covered from very base with long, simple, articulate, often longitudinally appressed, multicellular hairs particularly densely above. Basal leaves oval or oblong-oval, less often oblong, tapered into broad, flat and amplexicaul petiole, obtuse or slightly subacute, with remote teeth; cauline leaves 2–3, less often up to 5 pairs, uppermost pair obliquely opposite or even alternate, oblong-ovate or oblong, sessile, narrowed toward base, in very rare cases long-petiolate (f. *petiolata* Iljin) sparsely serrate; all leaves sparsely hairy on both sides, densely ciliate-hairy on margin, with 3, less often 5 veins, with arcuate lateral
667 veins, 5(3)–12 cm long and 1–4 cm wide. Capitula solitary, on peduncle 3–15 cm long, with ligulate florets 3–6 cm in dia. Involucre 10–17 mm long, of 16–27 lanceolate, often narrowly lanceolate involucre bracts callously thickened above, or even acuminate and recurved, with sparse or denser hairs on outside but less dense than at tip of peduncle with same type of hairs, less often also with sessile or subsessile glands. Ligulate florets yellow, 15–25, with glabrous ligules, with 3–4 teeth or lobes, 12–19 mm long and 3–7 mm wide, with 7–12 darker veins, terminating into short, entirely glabrous, 3.0–4.5 mm long tube; corolla of tubular florets 5–7 mm long, with glabrous tube and broadly campanulate limb, almost as long as tube, their teeth with occasional short hairs and papillae on outside at tip, stamen tube blackish-violet (when dry), scarcely exerted from limb; pappus sordid-yellow, barbed, as long as tubular florets but longer than tube of ligulate florets; achenes 3.0–4.5 mm long, linear, grayish, covered with sparse, obliquely upright hairs and sometimes also with glands, sometimes subglabrous. Flowering July to August; fruiting September. (Plate XXXII, Fig. 2).

Grassy alpine balds, tallgrass slopes of [mud] volcanic cones, coastal lowlands.—*Far East*: Kamchatka (south; Commander Islands), Sakhalin (Kuril Islands). *General distribution*: Japan, North America (Aleutian Islands, Unalaska). Described from Unalaska Islands. Type in Leningrad.

Note. Maguire (op. cit.) reports that in the tubular florets the corolla tube can be glabrous or pilose (p. 489), and, on this basis, he treats *A. tschonoskyi* Iljin—the species described by me—as a synonym of *A. unalaschcensis* Less. I cannot agree with this. While processing material for the *Flora of the USSR*, I re-examined all the specimens of this species from the Commander Islands, the south of Kamchatka and the Kuril Islands, and despite a most careful examination under a

binocular microscope did not find any hairs on the tube of the tubular [or] ligulate florets; they were always entirely glabrous or sometimes with only rudiments of occasional hairs. Therefore, *A. tschonoskyi*, with a strongly pilose corolla tube of the tubular florets is a separate species, growing in Japan. Moreover, typical *A. unalaschcensis* Less. is not found at all in Japan, even among the plants with glabrous corolla tubes. The question of the taxonomic status of the Japanese plants can be resolved only by studying much more material. Maguire's error lies in the fact that among the specimens determined by him from our herbarium, one specimen, undoubtedly belonging to *A. mollis* Hook., was determined by him as *A. unalaschcensis* Less. (Tilesius' collections of *E. Sibiria* N. am.); since in *A. mollis* Hook. the corolla tube of the tubular florets is strongly pilose, the source of the inaccuracy in the description of *A. unalaschcensis* lies here. We must consider this determination as an inadvertent slip of pen, because these two species even belong to different subgenera.

The forms described by Herder (Herder in *Byull. Mosk Obshch. Priro.* 40 (1867) p. 423), *minor* seu *genuina* and β . *major* (*pedalis*) as well as f. *scaposa* B. Fedtsch. (*Fl. Il. Comm.* 1906, 55), are not taxonomically significant.

8. *A. sachalinensis* (Rgl.) A. Gray in Proc. Amer. Acad. XIX (1884) 55; Kom. *Opred. Rast. Dalnevost. Kr.* II, 1044; Iljin in *Tr. Bot. Muz. Akad. Nauk SSSR*, XIX, 117; Maguire, *Monogr. Gen. Arn.* 491.—*A. chamissonis* F. Schmidt. *Reise* (1868) 191.—*A. chamissonia sachalinensis* Rgl. *Suppl. ind. Sachal.* (1874) 151.—**lc.**: Maguire, op. cit. fig. 98, 99; Iljin, op. cit. Plate XI, Fig. 2.

Perennial. Plant up to 100 cm high, with long branched rhizomes; stems somewhat thick, ribbed-sulcate, simple, branched only at apex, glabrous, only below capitula with variously long, moniliform hairs, setose at tip. Leaves numerous, usually 12–20 pairs, 5–15 cm long and 1.2–4.0 cm wide, distant in lower part of stem, rather crowded in upper half, oblong or oblong-oval, sessile, narrowed toward base and merged with opposite leaf into short sheath, acuminate or acute, with remote sharp teeth, coarse, almost coriaceous, with distinct reticulate-arcuate veins, particularly beneath, on both sides glabrous, very rarely upper leaves with scarcely noticeable and very sparse short hairs, usually turning black when dry, mainly above; rosette not developed; lower cauline leaves withering before anthesis. Capitula solitary at apices of stems and branches, mostly in corymbose inflorescence, 20–35 mm in dia. Involucre 14–20 mm long; involucre bracts 8–15, oval or lanceolate, leafy, 4–8 mm wide, with distinct longitudinal veins, mostly at base with articulate, multi-cellular hairs like stem apex, in upper

part with sparse scattered hairs and glands or mostly glabrous, ligulate florets light yellow, 20–35 mm long, 10–18, with 3 teeth, with 7–11(13) veins, ligule 4.5–9.0 mm wide, with shorter tube having long, multi-cellular, erect hairs, terminating into erect hairs or thin long-pointed tip; ligule glabrous, stamen tube blackish-violet (when dry); tubular florets numerous, 7.5–12.0 mm long, gradually elongated into similarly hairy tube, much shorter than limb. Pappus stramineous, longer than tubular florets and tube of ligulate florets, short-barbed; achenes linear-terete, 6.5–9.0 mm long, sulcate-ribbed, with sparse, long, obliquely upright hairs, often glabrescent. Flowering July to August; fruiting August to September. (Plate XXXII, Fig. 3).

669 Mixed forests, shrub thickets, in mountain regions, along riverbanks.—*Far East*: Uda River Area, Sakhalin. Endemic. Described from Sakhalin Island. Type in Leningrad.

GENUS 1559. *Doronicum* L.^{1,2}

L. Sp. pl. (1753) 885.—*Aronicum* Neck. Elem. I (1790) 27.—*Grammarthron* Cass. in Bull. Soc. Philom. (1817) 32.

Capitula semiglobose or broadly campanulate, mostly solitary or sometimes 2–6(8), in corymbose inflorescence. Involucral bracts in 2–3 rows; outer bracts lanceolate, oblong-lanceolate, or lanceolate-linear, herbaceous, sparsely pubescent or in lower part glandular-hairy; inner bracts linear, linear-lanceolate, membranous, smooth, ciliate or in upper part, glandular-hairy, all bracts long-acuminate. Receptacle more or less convex, glabrous or hairy. Disk florets tubular, bisexual, yellow, in several whorls. Peripheral florets pistillate, ligulate, yellow, in single whorl; anthers at base undivided or auriculate-sagittate; stigma lobes of central florets apically truncate, short-tufted, in peripheral florets short, obtuse. Achenes oblong or oblong-turbinate, obtuse, with 10 equal, longitudinal ribs, mature achenes brown or dark brown, glabrous or covered with appressed, erect, white, straight hairs; pappus of ligulate florets (sometimes undeveloped) of numerous, one-rowed (in peripheral achenes) or many-rowed (in central achenes), white or rusty, sparsely barbed bristles.

Herbaceous perennials with basal and alternate cauline amplexicaul leaves.

The genus includes about 36 species distributed in the mountains of temperate regions of Asia and Europe, where its species are found up to 3,500 m; one species is found in northern Africa. The large,

¹Treatment by S.G. Gorschkova.

²Name of Arabic origin.

beautiful, golden-yellow flowers in the capitula of *Doronicum* and the easy cultivation are fostering wide distribution of some of the species in gardens and parks.

1. Ovaries and achenes of one type, smooth or sparsely pilose, all with pappus 2.
- + Ovaries and achenes of different types, peripheral ones glabrous very rarely sparsely pilose, without pappus; central ones short-appressed pilose, sometimes glabrous, with pappus 6.
2. Capitula solitary, sometimes 2 3.
- 670 + Capitula 2-4, on 10-28 cm-long peduncles with 1-3 small pales 3. **D. bargusinense** Serg.
3. Leaves large, basal and lower cauline leaves 5.5-12.5(16.0) cm long, 3.4-8.5(9.0) cm wide; basal leaves ovate or obovate-elliptical, oblong or oval, less often roundish, with petiole 6-23 cm long; ligulate florets with yellow corolla and glabrous ligules 4.
- + Leaves 1.7-4.5 cm long, 2-3 cm wide; basal leaves of different shape; ligulate florets with golden-yellow or pale yellow corolla, their ligules sparsely pilose at base 5.
4. Stem leafy up to tip, basally covered with small scale-like, amplexicaul leaves; basal leaves ovate or obovate-elliptical, less often roundish, petiole 6-19 cm long; lower cauline leaves ovate-oblong, narrowed into winged petiole 2 cm long, other cauline leaves sessile. Capitula with involucre 2.2-3.0(4.0) cm in dia; outer involucre bracts oblong-lanceolate or lanceolate, inner linear-lanceolate or linear; ligulate florets with corolla 1.8-2.4 cm long, their tubes slightly shorter than pappus or half as long; achenes glabrous or sometimes sparsely pilose 1. **D. altaicum** Pall.
- + Stem in upper part without leaves, without scale-like leaves at base; basal and lower cauline leaves broadly ovate or elliptical, with petiole 13-23 cm long; middle leaves with petiole 3-5 cm long. Involucre 2 cm in dia; outer involucre bracts lanceolate-linear, sometimes divided up to a half; inner bracts linear; ligulate florets with corolla 1.4-1.5 cm long, their tubes as long as pappus; achenes glabrous 2. **D. schischkinii** Serg.
5. Basal leaves elliptical, elliptical-roundish or oblong, 4.5 cm long and 2 cm wide, with winged petiole, note; 4 mm long; cauline leaves ovate-oblong or oblong; lower leaves narrowed into 4 mm long, winged petiole, almost as long as lamina; ligulate florets with golden-yellow corolla 4. **D. clusii** (All.) Tausch.
- + Basal leaves ovate-roundish, 1.7-2.3 cm long, 2.2-3.0 mm wide; with petiole 4-6(14) cm long more or less thickened at base; lower cauline leaves lyrate or cordate, amplexicaul, sessile; ligulate florets

- with pale yellow corolla 5. **D. carpaticum** (Griseb. and Schenk) Nym.
6. Capitula numerous 7.
- + Capitula solitary 9.
7. Rhizome tuberous, 0.8–1.3 cm thick; upper cauline leaves fiddle-shaped and oblong-lanceolate, sinuate-toothed 9. **D. pardalianches** L.
- 671 + Rhizome slender; upper cauline leaves ovate or ovate-cordate 8.
8. Basal leaves 3.5 cm long, 4 cm wide, ovate-cordate, obtuse, with 4 cm-long petiole; cauline leaves decurrent, with cordate, amplexicaul auricles. Involucre 2–3(3.5) cm in dia; involucre bracts sparsely pilose; ligulate and tubular florets with glabrous corolla 6. **D. austriacum** Jacq.
- + Basal leaves 9–19 cm long, 9.5–18.0(27.0) cm wide, broadly ovate-cordate, with 22–35-cm long petiole; cauline leaves with amplexicaul auricles. Involucre 3–4(4.5) cm in dia; involucre bracts densely pubescent; corolla of ligulate florets with ligules short-pilose on outside at base, corolla of tubular florets sparsely pubescent 8. **D. macrophyllum** Fisch.
9. Rhizome tuberous or with nodular thickenings 10.
- + Rhizome slender 11.
10. Plant up to 80 cm high, glandular-pilose; rhizome tuberous; basal leaves oblong-elliptical or oblong, 4–11 cm long, 2.0–3.8 cm wide; cauline leaves lanceolate or broadly linear; corolla of ligulate florets bright yellow, with glabrous ligules 10. **D. longifolium** Griseb. and Schenk.
- + Plant up to 47 cm high, glabrous; rhizome with nodular thickenings; basal leaves broadly ovate-roundish or roundish-cordate, 3–5(6) cm long and 3.5–6.0(6.5) cm wide; cauline leaves ovate or ovate-elliptical; corolla of ligulate florets pale yellow, with ligules crisped-pilose at base 7. **D. orientale** Hoffm.
11. Basal leaves elliptical or obovate-oblong, 2.5–7.0(10) cm long and 1.7–3.0(4.3) cm wide, with up to 16–20-cm long petiole; outer involucre bracts lanceolate, 1.5–3.5(4.0) mm wide, inner bracts narrowly lanceolate, 1.2–3.0 mm wide; corolla of ligulate florets with glabrous tubes and basally pilose ligules 11. **D. oblongifolium** DC.
- + Basal leaves obovate-spatulate or almost round, 3–11 cm long and 4.0–8.5 cm wide, with up to 15 cm-long winged petiole; outer involucre bracts lanceolate-linear or lanceolate, 1.8–2.0(3.0) mm wide; inner linear, 1.0–1.2(1.5) mm wide; corolla of ligulate florets with tubes densely glandular-hairy on outer side and glabrous ligules 12. **D. turkestanicum** Cavill.

Section 1. Aronicum Neck. Elementa bot. I (1790) 26, sub gen.—*Grammarthron* Cass. in Bull. Soc. Philom. (1847) 32, sub gen.—*Doronicum* sect. *Doronicum* Tausch in Flora, XI (1828) 778.—*Doronicum* sect. *Aronicum* Hoffm. in Pflzfam. IV, 5 (1892) 294.—
672 Sect. *Doronicastrum* Cavill. in Ann. Conserv. Jard. Bot. Genève, XIII-XIV (1909-1911) 339 p. p.—Ovaries and achenes all similar glabrous or sparsely pilose, with pappus of one-rowed bristles in peripheral florets, and many-rowed bristles in central florets.

Series 1. Altaica Gorschk.—Basal leaves ovate, obovate-elliptical or broadly ovate, 6-16 cm long, 3.0-8.5 cm wide, with (13)20-28 cm-long petiole; ligulate florets with yellow corolla and glabrous ligules.

1. **D. altaicum** Pall. in Acta Ac. Petrob. VI, 2 (1783) pro Anno 1779, 271; Ldb. Fl. Alt. IV, 113; Cavill. in Ann. Cons. Jard. bot. Genève, X, 191, XIII-XIV, 355; B. Fedtsch. Rast. Turk. 742; Kryl. Fl. Zap. Sib. XI, 2830.—*Aronicum altaicum* DC. Prodr. VI (1837) 320; Ldb. Fl. Ross. II, 624; Turcz. Fl. baic.-dahur. II, 85.—*Arnica altaica* Turcz. in Bull. Soc. Nat. Mosc. I (1838) 95.—**lc.**: Pall. op. cit. tab. 16; Pall. Enum. Pl. b. 2.—**Exs.**: P. Smirn. Pl. Alt. exs. No. 92.

Perennial. Plant (8.5)10-80 cm high, glabrous; rhizome 0.3-0.8 cm thick, horizontal, sometimes oblique. Stem solitary, erect, simple, densely glandular-pilose above, green or brownish, sometimes reddish-violet, throughout leafy. Basal leaves (often withering) ovate or obovate-elliptical, less often roundish, 5.5-10.0(16.0) cm long and 3.4-6.0(9.0) cm wide, with 6-19(20) cm-long petiole; lower cauline leaves ovate-oblong, 5-6(11) cm long and 4.0-4.7(6.0) cm wide, narrowed into 2 cm-long broad-winged petiole; basal and lower cauline leaves at base of stem often reduced to small, amplexicaul, scale leaves 1.0-2.5 cm long and 0.8-1.6 cm wide; other leaves broadly ovate; middle leaves 4-7(10) cm long and 2-4(7) cm wide, upper leaves 2.5-5.5 cm long and 0.8-2.5 cm wide, broadly cordate, amplexicaul; all leaves glabrous, subobtusate or weakly acute, sinuate-short-toothed sometimes entire, along margin glandular-ciliate. Capitula solitary (less often 2) large. Involucre 2.2-3.0(4.0) cm in dia; involucre bracts uniform, 1.0-1.3 cm long; outer bracts oblong-lanceolate or lanceolate, (1.5)1.8-2.0 mm wide, at base glandular-pilose; inner bracts linear-lanceolate or linear, 0.5-1.0 mm wide, smooth, all bracts long-acuminate. Ligulate florets 2.0-2.5 cm long; corolla 1.8-2.4 cm long, yellow, their tubes 2.0-2.5 mm long, ligules 1.6-2.2 cm long and 2.5-3.5 mm wide, one-third longer than involucre bracts, smooth, with 3-4 veins and 3 teeth at apex; central tubular florets 5.0-5.5(6.0) mm long, their corollas 4.0-4.5 mm long, yellow, slightly longer or as long as pappus, with 5

small teeth 1 mm long. Achenes dark brown, smooth or sparsely hairy, 2–4 mm long and 0.8 mm wide, all with white pappus, 3–4 mm long, or with numerous barbed bristles. Flowering June to August.

Alpine and subalpine meadows, spruce forests, juniper thickets.—*Western Siberia*: Ob River Area, (southern part), Irtysh, Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai Region, Tien Shan. *General distribution*: Mongolia, Dzhungaria-Kashgaria. Described from Altai. Type in London.

2. **D. schischkinii** Serg. in Sistemat. Zam. Gerb. Tomsk. Univ., 1–2 (1949) 15; Kryl. Fl. Zap. Sib. XI, 2831.

Perennial. Plant 35–60 cm high; rhizome horizontal, creeping, up to 1 cm thick; stem solitary, erect, densely glandular pilose below inflorescence, glabrous or sparsely short-hairy in remaining part, like leaves. Basal and lower cauline leaves broadly ovate or elliptical, (8)11–12.5 cm long and (4)7–8.5 cm wide, petiole (6)13–23 cm long; middle cauline leaf with 3–5 cm-long petiole; upper leaves 4–5, ovate or oblong-ovate, gradually reduced, 2–12 cm long and 0.6–3.5 cm wide, sessile, semiamplexicaul all leaves with irregular small teeth. Capitula solitary. Involucre 2 cm in dia; outer involucre bracts lanceolate-linear, 1 cm long and 1.5 mm wide, sometimes divided up to a half, densely glandular-pilose; inner bracts slightly shorter, linear, 0.8 cm long and 0.8 mm wide, smooth; all bracts long- and thin-pointed. Ligulate florets 1.5–1.6 cm long, corolla yellow, 1.4–1.5 cm long, corolla tube 1–2 mm long, as long as pappus, ligules 1.3–1.4 cm long and 1.8–2.0 mm wide, a third or a fourth longer than involucre bracts, smooth, with 3–4 veins and 3 teeth 1 mm long; central florets 5.0–5.5 mm long, with yellow corolla 2 times as long as pappus, glabrous, with 5 teeth 1 mm long. Achenes glabrous, brownish, pappus 1.5–2.0 mm long, as long as achene consisting of numerous serrate bristles. Flowering July to August and September.

Alpine meadows, stony taluses and terraces above glaciers.—*Western Siberia*: Altai. Endemic. Described from upper reaches of Katun River. Type in Tomsk.

3. **D. bargusinense** Serg. in Sistemat. Zam. Gerb. Tomsk. Univ. 1–2 (1949) 14; Kryl. Fl. Zap. Sib. XI, 2831.

Perennial. Plant glabrous, 45–75 cm high; rhizome horizontal or weakly ascending, 0.5–1.0 cm thick. Stem basally covered with scale leaves. Basal leaves ovate, 6–15 cm long and 3.0–7.5 cm wide, glabrous, inconspicuously toothed, petiole 20–28 cm long; cauline leaves ovate, 4–8 cm long and 2.5–6.0 cm wide, with fine and coarse teeth, sessile,

amplexicaul, only lowermost leaf with short winged petiole, on both sides glabrous, less often with short sparse hairs. Capitula 2–4 (sometimes solitary), on 10–28 cm-long peduncles with 1–3 small, lanceolate, acute leaves 4 cm long and 1 cm wide, densely glandular-hairy below capitulum. Involucre 2.5–3.5 cm in dia; outer involucrel bracts lanceolate, 1.5 cm long and 1.5–1.8 mm wide, inner bracts lanceolate-linear, 1.3–1.5 cm long and 0.5–0.6 mm wide; all bracts thin-acuminate, glandular-hairy. Ligulate florets 2 cm long, with yellow, glabrous, corolla 1.8 cm long, corolla tube 2 mm long and linear, ligule 1.6 cm long and 1.5 mm wide, with 3–4 veins and 3 teeth; tubular florets 6 mm long, with yellow, glabrous, corolla, 4.5–5.0 mm long. Mature achenes brownish, glabrous or sparsely pilose in upper part, 3–4 mm long and 1.2 mm wide, ribbed; pappus (4)6 mm long, of numerous, rusty, barbed bristles. Flowering July.

Subalpine meadows, along banks of streams and rivers and in wet lowlands.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans. Endemic. Described from Barguzin Range. Type in Tomsk.

Series 2. Carpatica Gorsch. — *Doronicum* Subsect. *Cardyophylla* Cavill. in Ann. Conserv. Jard. Bot. Genève, XIII–XIV (1909–1911) 341 p. p. — *Doronicum* Subsect. *Grandiflora* Cavill. ibid., 354, p. p. — Basal leaves elliptical, oblong or ovate-roundish, (1)1.7–4.5 cm long and (1.7)2–3 cm wide, petiole 4–6(13) cm long; ligulate florets with pale yellow corolla and ligules, pilose at base.

4. D. clusii (All.) Tausch in Flora, XI (1828) 178 excl. var. β . and var. ν .; Cavill. in Ann. Conserv. Jard. Bot. Genève, X, 1220; Ej. op. cit. XIII–XIV, 359; Popov. Konsp. Fl. Zakarp. Obl. 246. — *Arnica clusii* All. in Mel. phil. et meth. soc. Turin, V (1770–1773) 70. — *Doronicum scorpioides* Lam. Encyl. meth. II (1786) 313. — *D. hirsutum* Lam. ibid. — *A. clusii* Hausm. Fl. Tirol. I (1851) 462; Klok. in Vizn. Rosl. URSR, 552. — **lc.**: All. Fl. pedem. tab. XVII, fig. 1 and 2; Hegi, Ill. Fl. VI, 2, 724 and 725. — **Exs.**: Fl. Exs. Austro-Hung. No. 1817; Fl. Exs. Reipubl. Bohem.-Sloven No. 953.

Perennial. Plant 9–20(40) cm high; rhizome oblique or horizontal; stem solitary, straight or weakly flexuous, more or less pilose. Leaves glabrous (var. *glabratum* Tausch) or sometimes covered with white, long, sparse, multi-cellular, — hairs (var. *villosum* Tausch), entire or sinuate-toothed, elliptical or oblong, 4.5 cm long and 2 cm wide, basally narrowed into winged petiole 4 cm long; cauline leaves ovate-oblong or oblong, lower ones 3.5–4.5 cm long and 1.6–2.0 cm wide, basally narrowed into winged petiole, 2.5 cm long; upper semiamplexicaul, 1–2 cm long and 0.3–0.8 cm wide, sessile, at base often sinuate-toothed

or incised; all leaves acuminate. Capitula solitary (less often 2), large. Involucre 3 cm in dia, with 1.3 cm long, uniformly acuminate involucre bracts; outer bracts lanceolate, 3 mm wide, covered with multi-cellular, long, simple and glandular hairs, inner bracts linear, 1 mm wide, 675 sparsely pubescent; all bracts long-ciliate along margin. Ligulate florets with golden-yellow corolla, 2.5 cm long, corolla tubes glabrous, shorter than pappus and ligule, 2.2 cm long and 2.8 mm wide, at base sparsely pilose; central florets with glabrous, yellow corolla 4 mm long, longer than pappus, with 5 teeth 0.5 mm long. Achenes 2.5 mm long, pubescent; pappus in all achenes 3.0–3.5(4.0) mm long, of numerous, serrate bristles. Flowering July.

Stony, turf slopes at 1,500–3,000 m.—*European part*: Upper Dniester (Chernaya gora[Black Mountain]; Pope Ivan). *General distribution*: Central Europe. Described from Pemonte.

Note. It is a rare plant in our country, collected by M.G. Popov in the Carpathians, which, as mentioned by him, represents a transition from *D. clusii* to the more southern species *D. longifolium*.

5. *D. carpaticum* (Griseb. and Schenk) Nym. Syll. fl. europ. Suppl. (1865) 1; Cavill. in Ann. Conserv. Jard. Bot. Genève, X, 227, XIII–XIV, 146; Popov, Konsp. Fl. Zakarp. Obl. 248.—*Arnica scorpioides* Baumg. Enum. stirp. Fl. Transs. III (1816) 133.—*Arnicum scorpioides* var. *carpaticum* Griseb. and Schenk in Wieg. Arch. (1852) 342.—*A. carpaticum* (Griseb. and Schenk) Schur in Verb. Siebenb. Nat. Ver. (1859) 137; Klok, in Vizn. Rosl. URSR, 552.—**Exs.** : Fl. Exs. Austro-Hung. No. 1816.

Perennial. Plant 12–50 cm high; rhizome horizontal; stem solitary, erect, simple, glabrous, sometimes glandular-pilose in upper part below inflorescence. Leaves membranous, glabrous or sparsely pilose, ciliate, at base of stem approximate; basal leaves usually numerous, ovate-roundish, (1)1.7–2.3 cm long and (1.7)2.2–3.0 cm wide, obtusely toothed, with petiole (2)4–6(14) cm long, at base more or less expanded; lower cauline leaves 4.5–6.5 cm long and 2.8–4.0 cm wide, fiddle-shaped or mostly cordately amplexicaul, sessile, mostly acuminate; upper leaves 2.0–2.5 cm long and 0.8–1.2 cm wide, cordately amplexicaul, sessile, acuminate. Capitula solitary. Involucre 3 cm in dia, with similar bracts 1.3 cm long; outer involucre bracts lanceolate, 2 mm wide, sparsely glandular-pilose in lower part, inner ones linear, 1.0–1.2 mm wide, smooth; all bracts acuminate, long-ciliate. Ligulate florets with pale yellow corolla, 2 cm long, tubes 2.0–2.5 mm long, shorter than pappus, glabrous, ligules 1.8 cm long and 3 mm wide, a third longer than involucre bracts, with 3–4 veins and 2–3, mostly irregular teeth in upper part, sparsely pilose in lower part on outer

side; central florets with yellow corolla, 3–4 mm long, as long as pappus and glabrous, with 5 teeth. Achenes brownish, 2 mm long and 0.8 mm wide, whitish-hairy; pappus in all achenes 4(5) mm long, consisting of numerous, white, barbed bristles. Flowering June to July.

Hollows, turfy slopes and on limestone rocks of alpine zone.—*European part*: Upper Dniester (Chernaya Gora, [Black Mountain], Goverla; Petrosh, Svidovets, Bliznetsy). *General distribution*: Central Europe, Balkans-Asia Minor. Described from southern Transylvania. Type in Leipzig.

- 676 **Section 2. *Pardalianches*** Tausch in Flora, XI (1828) 182.—*Doronicum* sect. *Eudoronicum* DC. Prodr. VI (1837) 320; Hoffm. in Pflanzenfam. IV, Abt. 5 (1892) 294.—*Doronicum* sect. *Doronicastrum* Cavill. in Ann. Conserv. Jard. Bot. G  n  ve, XIII–XIV (1911) 339 p. p.—Ovaries and achenes of different types, peripheral glabrous, very rarely sparsely pilose, lacking pappus, central covered with short, appressed-pilose, sometimes glabrous, with pappus.

Series 1. *Austriaca* Cavill. in Ann. Conserv. Jard. Bot. G  n  ve, XIII–XIV (1909–1911) 338 and 340 pro sub sect.—Stems densely leafy; lower leaves ovate-cordate, 3.5 cm long, 4 cm wide, at base narrowed, with approximate auricles and radiating principal veins; capitula numerous.

6. ***D. austriacum*** Jacq. Fl. Austr. II (1774) 18; Cavill. in Ann. Conserv. Jard. Bot. G  n  ve, XIII–XIV, 225, 340; Vozn. Rosl. URSR, 51.—*D. longifolium* Rchb. Fl. Germ. Exc. II (1830–1832) 234.—*Arnica austriaca* Hoppe and Sturm. Deutschl. Fl. Heft. 38 (1814) 16.—**Ic.**: Jacq. op. cit. tab. 130; Rchb. f. Ic.: Fl. Germ. tab. 66–CMLVII; Sturm op. cit. tab. XIX, 2; Hegi, Ill. Fl. VI, 2, 713, fig. 421, 714, fig. 422.—**Exs.**: Fl. exs. Reipubl. Bohem.-Sloven. No. 376; Fl. Siles. exs. No. 835; Fl. exs. Austro-Hung. No. 1818; Fl. stir. exs. No. 582.

Perennial. Plant 60–100 cm high; rhizome cylindrical, short, horizontal or oblique, not branched. Stem erect, branched above, glandular particularly below capitulum, and pilose on peduncles. Leaves sparsely pilose above with whitish, multi-cellular hairs, with similar long, white hairs and short glands beneath (more densely along veins); lower leaves ovate-cordate, 3.5 cm long, 4 cm wide, obtuse, obtusely toothed, with slender, petiole 4 cm long; cauline leaves 15–20 cm long, 8–10 cm wide, ovate, acuminate, lamina decurrent, with cordate, amplexicaul auricles, 2–4 cm long and 1.5–2.0 cm wide, upper leaves oblong or lanceolate, 6.5–9.5(17) cm long, 3.5–4.5(6.5) cm wide, long-pointed, sessile, amplexicaul. Capitula numerous [sic.; recte few] (3–8), aggregated in corymbose inflorescence. Involucre 2–3(3.5) cm in

dia, with similar bracts, 8–9 mm long; outer involucre bracts lanceolate, 1.8 mm wide, sparsely pilose; inner ones 1.2 mm wide, narrowly lanceolate, long-glandular-pilose only in upper part; all bracts acute and ciliate. Ligulate florets 2 cm long, with bright yellow corolla, 1.8–1.9 cm long, tube 2 cm long and linear ligules, twice as long as involucre bracts, glabrous, with 4–5 veins and 3 teeth above; tubular florets 6 mm long, their corollas yellow, slightly longer than pappus, with 5.1 mm-long teeth. Achenes oblong, dark green or brown, 2 mm long, 0.8–1.0 mm wide, with 10 light colored ribs; peripheral achenes glabrous, 677 lacking pappus; central achenes with white, appressed hairs and 4 mm long pappus of numerous, white, finely barbed bristles. Flowering July.

Montane, spruce, beech, ash forests, and alder thickets.—*European part*: Upper Dniester. *General distribution*: Central Europe, Atlantic Europe, Mediterranean Region (west), Balkans-Asia Minor. Described from Austria. Type in Vienna.

Series 2. Cardiophylla Cavill. in Ann. Conserv. Jard. Bot. G n ve, XIII–XIV (1909–1911) 338 and 341, pro subsect. p. p. (excl. *D. carpaticum* Nym.).—Stems with few leaves, lower leaves broadly ovate-cordate, 3–5(6) cm long, 3.5–6.0(6.5) cm wide, with remote auricles and flabellate midrib; capitula solitary or few. Beside *D. orientale* Hoffm., this series includes *D. carpetanum* Boiss. and Reut. from Spain and *D. cordatum* from the mountains of central Europe.

7. *D. orientale* Hoffm. in Comment. Soc. phys. med. Moscou, I (1808) 8; Willd. Enum. pl. Hort. Reg. Bot. Berol. 898; Cavill. in Ann. Conserv. Jard. Bot. G n ve, XIII–XIV, 242, 342; Grossh. Fl. Kavk. IV, 145.—*D. caucasicum* MB. Fl. taur.-cauc. II (1808) 321, III, 577; DC. Prodr. VI, 320; Ldb. Fl. Ross. II, 625; Boiss. Fl. or. III, 380; Schmalh. Fl. II, 81.—*D. pardalianches* auct. non L.: Sibth. and Sm. Prodr. fl. graec. II (1813) 183.— *Ic.*: Gartenfl. XXVII, 127; Bot. Mag. LIX, tab. 3143.— *Exs.*: Fl. cauc. exs. No.100.

Perennial. Plant glabrous, 47 cm high; rhizome horizontal, nodulose, branched, with lanate scales on collar. Stem solitary, straight or sometimes more or less flexuous, green. Basal leaves (3–4), broadly ovate-roundish or roundish-cordate, 3–5(6) cm long, 3.5–6.0(6.5) cm wide, broadly sinuate-toothed or obtusely toothed, sometimes entire, with 3.5–5.5(10.0) cm-long petiole; cauline leaves (1–2) ovate or ovate-elliptical, 3.0–5.5(8.0) cm long, 2.5–4.0(7.0) cm wide, sessile, amplexicaul, subacute; all leaves smooth, less often light green beneath. Capitula solitary, on long peduncles. Involucre (3.0)3.5–4.0 cm in dia; outer involucre bracts linear-lanceolate, 1.6 cm long, 1.2–1.5 mm wide; inner narrowly linear-lanceolate, slightly shorter and narrower; all bracts

long-acuminate, green, sparsely glandular with fine glands, long-ciliate along margin. Ligulate florets 1.7–2.4 cm long, with pale yellow corolla 1.6–2.0 cm long, with oblong ligules slightly longer or shorter than involucre bracts, with 4–5 veins, at base with curly hairs, and smooth corolla tube 2–3 mm long; central florets 5–6 mm long, with yellow corolla, as long as pappus with 5.1 mm-long teeth. Achenes 1.5–1.8 mm long, 0.5–0.8 mm wide, of different types; outer achenes glabrous, without pappus; inner covered with stiff appressed hairs; pappus white, 2 times as long as achene, of numerous, barbed bristles. Flowering March to April.

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Mountains, in middle mountain zone.—*Caucasus*: Ciscaucasia, Eastern and Western Transcaucasia. *General distribution*: Central Europe, Mediterranean Region, Balkans-Asia Minor. Described from vicinity of Dzekhet.

Series 3. *Macrophylla* Cavill. in Ann. Conserv. Jard. Bull. G  n  ve, XIII–XIV (1909–1911) 338 and 344, pro subsect.—Stems with few leaves; lower leaves broadly ovate-cordate, 9–19 cm long, 9.5–18.0(27.0) cm wide, twice as wide at base, auricles widely spaced, principal veins palmate; capitula numerous. Besides *D. macrophyllum* Fisch., this series includes *D. haussknechtii* Cavill., *D. maximum* Boiss. and Huet., *D. macrolepis* Freyn and Sint., *D. balansae* Cavill., and *D. cacaliaefolium* Boiss. and Heldr.

8. ***D. macrophyllum*** Fisch. Catal. Jard. Gorenk. (1812) 40; DC. Prodr. VI, 321; Ldb. Fl. Ross. II, 625; Boiss. Fl. or. III, 379; Schmalh. Fl. II, 81; Grossh. Fl. Kavk. IV, 145—Cavill. in Ann. Conserv. Jard. Botan. G  n  ve, XIII–XIV, 248, 345.—*D. austriacum* MB. Fl. taur.-cauc. II (1808) 321, excl. syn. III, 576 non Jacq.—*D. vaginatum* C. Koch in Linnaea, XXIV (1851) 356.—*D. dolichotrichum* Cavill. op. cit. XIV (1909–1911) 252.—**lc.**: Sturm Deutschl. Fl. tab. 1243; Larin et al. Korm. Rast. Senokos. i Pastb. SSSR 581, Fig. 426.

Perennial. Plant 75–100 cm high, covered with long, white, multicellular and short-glandular hairs (except leaves, corolla, and achenes of ligulate florets); rhizome short, without branches. Stem erect, green, simple or branched above and sometimes reddish-violet, sparsely leafy. Leaves broadly ovate-cordate, with coarse, acute teeth; basal leaves 9–19 cm long, 9.5–18.0(27) cm wide, with 22–33 cm-long petiole; cauline leaves 6.5–16.0 cm long, 7–16 cm wide, with amplexicaul auricles 4 mm long, 4.0–5.5 mm wide, with 4–17 cm-long petiole; upper leaves 5.0–9.5 cm long, 3–7 cm wide, sessile amplexicaul; bracteal leaves a third to a half as long. Capitula large, on 6–20(32) cm-long peduncles, in clusters of 2–5(6) in corymbose inflorescence. Involucre (2)3–4(4.5) cm in dia, with similar involucre bracts, 1.1–1.3(1.8) cm long, thin-

and long-acuminate apices, densely pubescent, ciliate; outer bracts lanceolate or oblong-lanceolate, 1.5(1.8) mm wide; inner narrowly lanceolate, 1.0(1.2) mm wide. Ligulate florets 2.0–4.2(4.5) cm long, with bright yellow corolla 1.8–4.0(4.4) cm long, and glabrous tube 2–3 mm long, ligule longer than involucre bracts, 3.0–4.5 mm wide, with 4–5 dark veins, short-pilose at base, with 3 teeth above; central tubular florets 5–7 mm long, with yellow corolla 4.0–5.5 mm long, sparsely pubescent, slightly longer than pappus, with 1.2 mm-long teeth. Achenes of peripheral ligulate florets 4 mm long, 1.5 mm wide, glabrous, without pappus; achenes of central tubular florets 2–3 mm long, 1.0–1.2 mm wide, covered with white appressed hairs, with
 679 pappus; pappus as long as achenes, of numerous white barbed bristles. Flowering June to August.

Alpine and subalpine zones, in hornbeam forests, rhododendron thickets, and meadows.—*Caucasus*: Ciscaucasia, Dagestan, Eastern, Western, and Southern Transcaucasia. *General Distribution*: Armenia and Kurdistan, Iran (north). Described from Beshtau Mountains. Type in Leningrad.

Series 4. Pardalianches Cavill. in Ann. Conserv. Jard. Bot. G  n  ve, XIII–XIV (1909–1911) 338 and 348, pro subsect.—Stems sparsely leafy; lower leaves broadly cordate-ovate, 4–9 cm long, 3.5–8.0 cm wide, at base narrow, auricles approximate and main veins divergent; capitula numerous. Beside *D. pardalianches* L., this series includes *D. roylei* DC. from the western Himalayas, *D. thirkei* Schultz. from Olympus Mountain in Greece. *D. reticulatum* Boiss. from Lydia, and *D. atlanticum* Chab. from the mountains in Algeria and Tunisia.

9. *D. pardalianches*¹ L. Sp. pl. (1753) 885 excl. var.; DC. Prodr. VI, 320; Ldb. Fl. Ross. II, 625; Cavill. in Ann. Conserv. Jard. Bot. G  n  ve, XIII–XIV, 278 and 350; Vozn. Ross. URSR, 551.—*Ic.*: Rchb. Ic. Fl. Germ. XVI, tab. 64, 955, f. II; Sturm. Fl. Deutschl. Ed. 2, XIII, tab. 58; Hegi, Ill. VI, 2, tab. 719, fig. 428.

Perennial. Plant 30–120 cm high, covered with several rows of multi-cellular, white, long and short hairs and sparse glandular short-stalked glands (except tubular florets and peripheral achenes); rhizome horizontal, tuberous, 0.8–1.3 cm thick; stem solitary, straight or weakly flexuous, simple or branched in upper part. Basal leaves ovate-cordate, 4–9 cm long, 3.5–8.0 cm wide, petiole 5–17 cm long; middle cauline leaves similar, (4)8–11 cm long, (2)7.0–8.5 cm wide, sinuate-toothed, with auriculate petioles 5.5–11.0 cm long; upper cauline leaves oblong-

¹The Latin epithet of this species is the Greek name of some poisonous plant in the works of Aristotle, which was used to poison snow leopards; the very name means "snow-leopard killer."

lanceolate 1–8 cm long, 0.4–4.5 cm wide, amplexicaul, sessile, of these, lower leaf lyrate; all leaves obtuse or upper leaves more or less subacute. Capitula 2–5. Involucre 2.5–4.5(5.5) cm in dia; involucre bracts uniform, long-acuminate, outer narrowly lanceolate, 1.8 cm wide, inner linear, 0.8–1.2 mm wide. Ligulate florets 1.3–1.6 cm long, with yellow corolla 1.2–1.4 cm long, their tubes 1.5–2.0 mm long, glabrous, ligules linear, 1.0–1.2 cm long, mostly as long as involucre bracts, (1.5)2–3(4) mm wide, with 4 veins and 3 teeth above, in lower part pilose; tubular florets 4–5 mm long, their corollas yellow, 3.5–4.5 mm long, one-third longer than pappus, with 5 teeth. Achenes of peripheral ligulate florets 680 glabrous, without pappus; achenes of central tubular florets appressed-pilose, with 3 mm long white pappus. Flowering July to September.

Mountains up to 1,500–1,700 m, in forests and coastal scrubs.—*European part*: Upper Dniester. *General distribution*: Scandinavia, Central Europe, Atlantic Europe, Mediterranean Region (west), Balkans-Asia Minor (west). Described from Switzerland. Type in London.

Economic Importance. A medicinal plant; its rhizomes are used in the treatment of epilepsy and fits (*Visn. Rosl. URSR*, 551). Cultivated in Western Europe as a beautiful ornamental plant.

Series 5. Plantaginea Cavill. in Ann. Conserv. Jard. Bot. G n ve, XIII–XIV (1909–1911) 338 and 351, pro subspec.—Stems sparsely or densely leafy; lower leaves oblong, elliptical or obovate-oblong, less often roundish, 2.5–11.0 cm long, 1.7–8.5 cm wide, at base narrowed into petiole, its main veins divergent; capitula solitary or few. Besides *D. longifolium* Griseb. and Schrenk, *D. oblongifolium* DC., and *D. turkestanicum* Cavill., this series includes two more species: *D. plantagineum* L. from the Iberian Peninsula, southern England, and France, and *D. falconeri* Clarke from high-altitudes of Kashmir and western Tibet (Karakorum).

10. ***D. longifolium*** Griseb. and Schenk in Wiegmann. Archiv. XVIII (1852) 341, non Rchb.; Cavill. in Ann. Conserv. Jard. Bot. G n ve, XIII, 292, 353.—*D. hungaricum* Rchb. f. Ic. Fl. Germ. et Helv. XVI (1854) 34; Boiss. Fl. or. III, 381; Schmalh. Fl. II, 81; Fedtsch. and Fler. Fl. Evrop. Ross. 988; Vozn. Rosl. URSR, 551.—*Ic.*: Rchb. f. op. cit. tab. 65, fig. 1.—*Exs.*: Fl. exs. Reipubl. Bohem.-Gloven. No. 752 and No. 952; Fl. Hung. exs. No. 83; Fl. exs. Austro-Hung. No. 3441.

Perennial. Plant 25–80 cm high, more or less glandular-pilose; rhizome tuberous, branched. Stem erect, green or in upper part brownish-violet, at base usually densely leafy. All leaves undivided, glabrous or sparsely pilose, entire or sinuate-toothed; basal and lower cauline leaves oblong-elliptical or oblong, (4)5–11 cm long, 2.0–3.8

cm wide, subobtusate, narrowed into 4–9 cm long petiole; cauline leaves lanceolate or broadly linear-oblong, 2–5(8.5) cm long, 0.7–2.0 cm wide, sessile, at base toothed; upper leaves thin-acuminate. Capitula mostly solitary. Involucre 3.0–3.5 cm in dia; involucre bracts linear-lanceolate, similar, 1.3–1.5 cm long; outer bracts 1.2–1.8 cm wide, inner 0.8–1.0 cm wide; all bracts glandular-pilose, long- and thin-acuminate, ciliate along margin. Ligulate florets (1.6)2.6–3.1 cm long, with bright yellow corolla (1.5)2.5–3.0 cm long, their tubes 2.0–2.5(3.0) mm long, ligules (1.3)2.3–2.7 cm long, 2 mm wide, with 4 veins, glabrous, with 3 teeth above; central florets 5 mm long, with yellow, glabrous corolla 4 mm long, slightly longer than pappus, with 5 teeth 1 mm
681 long. Achenes of different types; peripheral achenes without pappus; central covered with white, upright hairs, with pappus; pappus of numerous, white, barbed bristles, 2.5–3.0 mm long. Flowering April.

Forests and glades.—*European part*: Upper Dniester (Transcarpathian Region; Chernaya Gora [Black Mountain], vicinity of Vinogradov), Bessarabia, Black Sea Region. *General distribution*: Central Europe, Balkans-Asia Minor (northwestern part). Described from Hungary. Type in Vienna.

11. **D. oblongifolium** DC. Prodr. VI (1837) 321; Ldb. Fl. Ross. II, 625; Boiss. Fl. or. III, 381; O. and B. Fedtsch. Perech. Rast. Turk. IV, 213; Cavill. in Ann. Conserv. Jard. Bot. Genève, XIII–XIV, 296, 353; B. Fedtsch. Rast. Turk. 742; Grossh. Fl. Kavk. IV, 145.

Perennial. Plant glabrous, 12–50 cm high; rhizome short, truncate, at collar covered with black scale-like bristles. Stem solitary, flexuous, green, sometimes reddish-violet above, with simple and glandular hairs in upper part. Basal leaves elliptical or obovate-oblong, 2.5–7.0(10.0) cm long, 1.7–3.0(4.3) cm wide, obtuse, narrowed into petioles up to 16(20) cm long; lower cauline leaves similar to basal leaves but narrowed into broadly winged petiole, semiamplexicaul or sometimes sessile; middle leaves linear-oblong, 4–12 cm long, 2–3 cm wide, sessile, like upper leaves somewhat acute, semiamplexicaul, upper 3–4 cm long, 1 cm wide; all leaves glabrous, entire or indistinctly toothed, glandular-ciliate along margin. Capitula solitary, on long peduncle, with involucre 3–4(4.5) cm in dia. Involucre bracts 1.2–2.0 cm long, covered with numerous white, long, simple, capitate, stalked glands, acuminate; outer bracts lanceolate, 1.5–3.5(4.0) mm wide, inner narrowly lanceolate, 1.2–3.0 mm wide. Ligulate florets 2.2–2.8(4.0) cm long, their corollas pale yellow, 2.0–2.6 cm long, with 2 mm-long tubes and 1.8–2.4(3.8) cm-long and 3.6–6.0 mm-wide ligules, with 4–6 dark veins and 3 teeth above, hairy outside at base; central florets 5–6 mm long, with yellow glabrous corolla, 3.0–3.5(4.5) mm long,

with large, 1.5 mm-long teeth. Achenes different types, peripheral achenes 1.8 mm long, 0.5 mm wide, glabrous or sparsely appressed-pilose, without pappus; central achenes 2.0–2.8 mm long, 0.8 mm wide, appressed-pilose; pappus of numerous, white, barbed bristles, 2.0–2.3(3.0) mm long and 0.8 mm wide. Flowering June to July.

Alpine zone, in ravines, passes, moraines, near glaciers, in subalpine and alpine meadows, spruce forests, and shrub thickets.—*Caucasus*: Ciscaucasia, Dagestan. Eastern, Western, and Southern Transcaucasia; *Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. Endemic. Described from eastern Caucasus. Type in Geneva.

12. **D. turkestanicum** Cavill. in Ann. Conserv. Jard. Bot. G n ve, XIII–XIV (1909–1911) 301, 354; Kryl. Fl. Zap. Sib. XI, 2832.—*D. oblongifolium* DC. var. *leiocarpum* Trautv. in Bull. Soc. Nat. Mosc. 682 XXXIX (1866) 361; O. and B. Fedtsch. Perech. Rast. Turk. IV, 213.—*Ik.*: Cavill. op. cit. fig. 46 and 47 (p. 302).

Perennial. Plant 25–80 cm high; rhizome horizontal or oblique. Stem solitary, erect, simple, covered with sparse, capitate glandular hairs, sometimes glabrous below. Leaves entire or with sparse small teeth, with short-acuminate or subobtusate, glabrous or sparsely short-pilose beneath and along margin. Basal leaves obovate-spatulate or almost round, 3–11 cm long, 4.0–8.5 cm wide, on winged, more or less condensed petiole, 5–15 cm long; cauline leaves oblong-ovate or oblong, 3–10(13) cm long, 2.0–4.5 cm wide, upper leaves 1–3 cm long, (0.4)1.4–2.0 cm wide; less often lower 2–3, with petiole (4)7–11 cm long, leaf next to them narrowed into winged, flattened, petiole 3–4 cm long and 2.5 cm wide, other leaves sessile. Capitula solitary, with involucre 3–4(5) cm in dia. Outer involucre bracts lanceolate or lanceolate-linear, 1.2–1.7 cm long, 1.8–2.0(3.0) cm wide, inner linear, 1.2–1.5 cm long, 1.0–1.2(1.5) mm wide; all bracts long-acuminate, glandular-hairy. Ligulate florets 1.8–3.0 cm long, with light yellow corolla 1.6–2.7 cm long, their tube 2.5 mm long, densely hairy and glandular on outside, ligules 1.4–2.3(2.4) cm long, 2.0–2.8 mm wide, slightly or a third longer than involucre bracts, glabrous, with 4–5 veins and 3 teeth above, central florets 5.5–7.0 mm long, their corollas dark yellow, 4.5–5.5 mm long, 1/3 longer than pappus, with 5 teeth 1 mm long. Achenes of different types; outer achenes glabrous, 2.8(4.0) mm long, 0.5(0.8) mm wide, without pappus; central achenes (2.0)3.0–3.5(4.0) mm long, 1 mm wide, glabrous, covered with sparse, appressed hairs; their pappus 3.0–3.5 mm long, of numerous, barbed bristles. Flowering June to August.

Alpine region, mixed herb meadows, on stony slopes of moraines, rocks, stony and rubbly tundras and in spruce forests and juniper thickets.—*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien-Shan. *General distribution*: Dzhungaria-Kashgaria. Described from Soviet Central Asia.

GENUS 1560. *Erechtites* Raf.^{1,2}

Raf. Fl. Ludov. (1817) 65.—*Neoceis* Cass. in Bull. Soc. Phil. (1820) 90.

Capitula many-flowered, heterogamous, peripheral florets pistillate, filiform-tubular, in 1–2 rows; disk florets bisexual or partly sterile, with 4–5-toothed, narrowly tubular corolla; anthers at base without or with very short auriculate appendages; style branches with conical, appendages hairy in upper part. Achenes oblong, with 10–20 fine ribs; pappus many-rowed, consisting of weakly scabrous hairs. Erect annual, or perennial, with
683 alternate, undivided or pinnatipartite leaves. Capitula with cylindrical or campanulate involucre; involucre bracts few, narrow, linear-setaceous. Inflorescence compound, corymbose; corolla yellow or whitish.

Species of this genus are distributed in North and South America.

1. *E. valerianifolia* (Wolf) DC. Prodr. VI (1837) 295; Makashvili, in Byull. Inst. Chaya i Subtrop. Kult. 3, 106; Manden. in Fl. Gruzii, VIII, 417.—*Senecio valerianifolius* Wolf, Ind. sem. hort. berol. (1825) ex Rchb. Icon. bot. exot. I (1827) 59.—*Crassocephalum valerianifolium* Less. in Linnaea, V (1830) 169, in synonym.—*Ic.*: Rchb. Ic. bot. exot. I (1827) tab. 85 (excl. fig. stig.).

Annual. Plants subglabrous, with erect, sulcate stem. Leaves pinnatipartite, with 6–8 lanceolate, short-toothed lobes on each side, sinuses between lobes narrow, with remote teeth or lobules. Inflorescence paniculate, with erect branches, of numerous capitula, more or less erect, later drooping; involucre cylindrical; pappus of pinkish-violet hairs.

An introduced plant, mostly a weed in tea plantations.—*Caucasus*: Western Transcaucasia (Chakva, Kobulety, and others). *General distribution*: Brazil and Central America. Described from Brazil? Type unknown.

Besides this species, one other species of the genus *Erechtites*, *E. hieraciifolia* (L.) Raf. is reported from the USSR from the Mukachev District (M.G. Popov, *Ocherk Rastitelnosti Karpat*, 1949, p. 245), which so far is found only in Western Ukraine. It is an annual, with the

¹Treatment by A.I. Pojarkova.

²*Erechtites* is a synonym of *Senecio* in the work of Dioscorides.

leaves sessile, oblong-lanceolate, irregularly coarse-toothed glabrous below, scabrous beneath along veins. Capitula 12–15, in corymbose inflorescence; involucre cylindrical, consisting of linear, scabrous, involucre bracts; pappus white. This plant comes from the southern states of North America and Mexico.

GENUS 1561. *Cacalia* L.^{1,2}

L. Sp. pl. (1753) 834, p. min. p. (quoad sp. Nos. 7, 8); Hoffm. in Pflanzenfam. IV, 5 (1894) 296, p. min. p.; Kitam. Compos. Japon. III (1942) 202, p. max. p. (excl. syn. *Mesadenia*).—*Hasteola* Raf. New Fl. North. Am. IV (1836) 79; Pojarkova, in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960) 380.—*Synosma* Raf. in Loud. Gard. Mag. VIII (1832) 247, nom. nud.; Britt. in Britt. a. Br. III, fl. N. Un. III (1898) 474, descr.—*Cacalia* sect. *Eucacalia* DC. Prodr. VI (1837) 327 p. min. p.—*Senecio* Benth. and Hook. f. Gen. pl. II (1873) 446, p. min. p. non L.—*Senecio* subg. *Cacalia* Maxim. in Mém. biol. IX (1877) 292.

Capitula homogamous, with (1)3–20(30) flowers, most often with 5–8 flowers. Involucre narrow, mostly tubular, consisting of (2)3–12(15) 684 free involucre bracts, in single row, sometimes with few, very small pales at base. Involucre bracts dimorphic; inner broader, with wide scarious border, outer narrower, with very narrow scarious fringe. Receptacle flat or weakly convex, finely alveolate. Flowers bisexual, all tubular; corolla whitish, with violet or yellowish tinge, in upper part campanulate or almost tubular, lobed up to a fourth to a third with deltoid teeth, abruptly narrowed below into narrow tube; anthers with narrow, deltoid apical appendage, sagittate, with sterile, acute, short, less often long, auriculate basal appendage fused in pairs with adjacent anthers; filaments in upper part expanded (with antherozoids). Style branches elongate, apically with conical, acute appendage, on outer side only below appendages or sometimes up to style fork covered with papillate hairs, longer at base of appendage, often forming tuft. Achenes narrowly terete, glabrous, brownish-yellowish, monochromatic, lacking rostellum, somewhat narrowed toward base, with many thin ribs; pappus mostly white, less often brownish, very rarely reddish, consisting of numerous, scabrous hairs. Perennial herbs; lamina reniform, roundish or deltoid-hastate, involute until opening or inclined to petiole and folded like closed umbrella; lower leaves long-petiolate, often with auricles sometimes fused along margin forming sheath. Inflorescence often paniculate, less often corymbose or racemose.

¹Treatment by A.I. Pojarkova.

²Name of the plant in the work of Dioscorides.

The genus is native mainly to eastern and southeastern Asia, where about 50 species are concentrated; one species (*C. hastata* L.) extends through Siberia into the northern part of the European territory of the USSR, and one (*C. suaveolans* L.) grows in the eastern part of North America.

Lectotype of genus: *C. hastata* L.

Note. Until now the question of the lectotype of the genus *Cacalia* L. could not be resolved, and in this connection it is not yet clear what generic name should be given to the Asian species of this genus, if it is treated in a narrow sense as in the present treatment, where the name *Cacalia* is limited to species of the Asian continent and one North American species (*C. suaveolens* L.). *Cacalia* has already been typified repeatedly. In my opinion, the question of the lectotype of the genus *Cacalia* was resolved best, i.e., in conformity with the recommendations of the International Code of Botanical Nomenclature, 1956, by Kitamura (*Compos. Japon.* III, 1942, p. 170), who proposed *C. hastata* L. as the lectotype. Unfortunately, this lectotype does not have priority and cannot be recognized. However, at the same time, neither of the two lectotypes proposed earlier can be accepted unequivocally. *Cacalia alpina*, proposed by Rydberg (*Bull. Torr. Bot. Club.* 5, 1924, p. 369), had already been split off by Cassini (1816) as the genus *Adenostyles* Cass. and is its type. The second lectotype, proposed in the list of lectotypes of species of Linnaean genera (A.S. Hitchcock and M.I. Green, *Propos. Brit. Bot.*, 1929), is *C. atriplicifolia* L. This species was split off by Rafinesque (*New Flora of N. Amer.*, 1836, p. 78) as the separate genus *Mesadenia* Raf. and was selected in 1898 (Britton a. Brown, *Illustr. Fl. North. Un. St.*, III) as the lectotype of this genus. According to the instructions in Appendix IV of the Code (Russian edition), the type of a aggregate genus that undergoes splitting must be selected from among the species remaining in it after the previous authors have or "author has already split off one or two elements as other taxa." These species split off earlier from an aggregate genus take priority over the lectotype selected later from among the remaining species of the genus only if it is proved that they satisfy better the requirements of a lectotype. Meanwhile *C. alpina* and *C. atriplicifolia*, as lectotypes, not only do not have priority over *C. hastata* but inevitably would lead to very undesirable consequences if either of them were to be restored as lectotype of the genus *Cacalia*. For example, authors who recognize the separate status of the genus *Mesadenia*, will be faced with the need to rename all the Asian species of the genus *Cacalia* s. l. (and there are about 50) and *C. suaveolens*, creating for them new combinations with the new generic name. As I have shown in my work (Pojarkova, 1960), *Hasteola* Raf. is such a generic name.

Selecting *C. hastata* L. as the lectotype for the genus *Cacalia* does not entail the need for new combinations. In the present treatment, I have retained the generic name *Cacalia* for our species with confidence that *C. hastata* L. will be recognized as the lectotype of the genus *Cacalia*.

1. Petioles of all leaves narrowed toward base and lacking auricles; middle cauline leaves deltoid hastate, with attenuate middle lobe and small, acute or acuminate, usually undivided lateral lobes; capitula with 4–10(20) florets; involucre campanulate, consisting of 8–10 involucre bracts 1. ***C. hastata* L.**
- + Petioles, at least of middle cauline leaves, expanded at base into amplexicaul auricles; lamina reniform, deltoid-reniform or broadly deltoid hastate; capitula with 5–8(12) florets; involucre cylindrical/ or campanulate-cylindrical, consisting of 4–7(8) involucre bracts 2.
2. Plants tall, up to 2–3 m high, robust; leaves to 36 cm long and 50 cm wide; capitula aggregated into large (to 60 cm long) pyramidal, strongly branched panicle with rather numerous (to 150–350) capitula, lateral branches of such panicles also with capitula aggregated into panicles 3.
- + Plants not so tall, 30–100 cm high, with leaves up to 25 cm wide, but usually much smaller; general inflorescence simple raceme or with less numerous florets and a shorter panicle; with capitula aggregated in raceme on its lateral branches 4.
3. Middle cauline leaves up to 35 cm long and 50 cm wide, broadly deltoid or broadly deltoid hastate, with broad, bifid lateral lobes and short-acuminate middle lobe; inflorescence with up to 200–350 capitula; involucre narrowly cylindrical, consisting of 4–5 involucre bracts; florets in capitula (3)5–7 3. ***C. komaroviana* (Pojark.) Pojark.**
- + Middle cauline leaves up to 35 cm long and 40 cm wide, deltoid or hastate, with more or less enlarged middle lobe and small acute or acuminate, undivided lateral lobes; panicles with up to 150–200(300) capitula; involucre campanulate-cylindrical, consisting of (5)6–8 involucre bracts; florets in capitula 7–10(12) 2. ***C. robusta* Tolm.**
4. Involucre bracts (4)5–8(9) mm long, at anthesis (before development of achenes) 1/2–2/3 as long as corolla and pappus; capitula aggregated in simple raceme, less often as condensed raceme with few short lateral branches in lower part; plant 30–100 cm high, with slender, 1.5–2.0(3.0) mm thick stem and remote leaves; middle cauline leaves 5–10 cm long and 7–14(16) cm wide 5. ***C. auriculata* DC.**

- + Involucral bracts 8–11(12) mm long, at flowering as long as corolla and pappus or slightly shorter, approximately $\frac{3}{4}$, rarely $\frac{2}{3}$ as long; capitula aggregated into panicles; plants taller, up to 120–150 cm high, with densely leafy stems, up to 7–8 mm thick; middle cauline leaves up to 15 cm long and 25 cm wide 5.
- 5. Inflorescence compact, with long, upright lateral branches often adpressed to main axis; peduncles thick; leaves irregularly toothed, large, with coarse, lobed teeth alternating with somewhat smaller teeth 6. **C. kamtschatica** (Maxim.) Kudo.
- + Inflorescence lax, narrowly cylindrical, panicle with usually remote branches; peduncles slender; leaves regularly toothed 4. **C. praetermissa** (Pojark.) Pojark.

Series 1. Hastatae Pojark.—General inflorescence lax pyramidal panicle with numerous capitula; lateral branches of inflorescence mostly in racemes, or weakly branched panicles. Involucre cylindrical-campanulate, with 8–10(12) involucral bracts. Flowers in capitulum 8–15(20), corolla tube two-fifths to two-thirds as long as limb, oblong-campanulate. Pappus of achenes white. Plants 40–150 cm high, with numerous, approximate, cauline leaves; lamina deltoid-hastate, up to 26 cm wide, with small undivided lobes and sinuate toothed margin.

687 *C. hastata* L. belongs to this series, which, judging from the herbarium material, has a closely related race in central China.

Not *C. robusta* Tolm., as A.I. Tolmatchev believes (1957), but the eastern North American species *C. suaveolens* L. is a close relative of *C. hastata*. It is distinguished from *C. hastata* by a corymbose inflorescence, more numerous-flowered capitula, shorter basal appendages and bigger antheropoidea. *C. suaveolens* must be put into a separate monotypic series *Suaveolentes* Pojark.

1. **C. hastata** L. Sp. pl. (1753) 835; DC. Prodr. VI, 327; Turcz. Fl. baic.-dahur. II, 86; Maxim. Prim. fl. amur. 164; Kom. Fl. Manchzh. III, 691; Fl. Kamch. III, 171; Fedtsch. and Fler. Fl. 989; Kitag. Lineam. fl. Manshur. 441; Kitam. Compos. Japon. III, 25 (excl. ssp. and var. var.).—*Cacalia suaveolens* auct., non L. (1753); Georgi, Besch. R. Reich. III, 5 (1800) 1229.—*C. glabra* Ldb. Ind. sem. hort. Dorpat. (1820) 16.—*C. sagittifolia* Mertens in Linnaea, V (1830) 63, nom. nud.—*Ligularia hastata* Less. Synops. Compos. (1832) 390; Turcz. Catal. baic. (1838) 11.—*Senecio sagittatus* Sch. Bip. in Flora, XXVIII (1845) 498.—*C. hastata* α . *pubescens* Ldb. Fl. Alt. IV (1833) 52; Fl. Ross. II, 626; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1044; Kryl. Fl. Zap. Sib. XI, 2834.—*C. hastata* β . *glabra* Ldb. Fl. Alt. IV (1833) 52; Fl. Ross. II, 626; Kryl. Fl. Zap. Sib. XI, 2834.—*Senecio*

sagittatus α . *pubescens* Maxim. in Bull. Acad. Sc. Pétersb. XIX (1874) 483; Mél. Biol. IX, 293.—*S. segittatus* β . *glaber* Maxim. in Bull. Acad. Sc. Petersb. XIX (1874) 483; Mél. biol. IX, 293, p. p. (excl. pl. jap.).—*C. hastata* ssp. *hastata* Hara, Enum. Spermatoph. japon. (1952) 149.—*Hasteola hastata* Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960) 381.—*Synosma hastata* Pojark. olim in sched.—*Ic.*: Pall. Fl. Ross. tab. 110; Fedtsch. and Fler. Fl. Fig. 989; Kom. and Alis. loc. cit. plate 313; Krasch. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, Fig. 689; Pojarkova, loc. cit. Fig. 3.

688 Perennial. Plant with horizontal rhizome, densely covered with slender, filiform, adventitious roots. Stem robust, erect, simple, 40–150 cm high and up to 8 mm thick at base, glabrous or subglabrous below, densely glandular hairy-floccose above below inflorescence, as also peduncle. Cauline leaves numerous, very approximate, glabrous on both sides (f. *glabra* Ldb.) or with more or less dense, appressed hairs (f. *pubescens* Ldb.) beneath; lowermost leaves strongly expanded deltoid-reniform, with hastate base, long-petiolate, withering early, considerably smaller than leaves above; middle cauline leaves 5.5–25.0 cm long and 6–26 cm wide, broadly deltoid-hastate, with acute or acuminate lobes, lateral lobes small, undivided and with truncate, cuneate or broadly sinuate base decurrent as wings in upper part of petiole; leaves gradually reduced toward stem apex, with increasingly fewer lobes and becoming deltoid; uppermost and bracteal leaves lanceolate; bracteal leaves usually linear, all leaves usually sinuate and small-toothed. Capitula drooping, usually aggregated into lax, narrowly pyramidal panicles, with long branches directed upward at acute angle, sometimes in racemes only in weaker plants; peduncles (axes of last order) 4–20 mm long; capitula 9–13 mm long and up to 8 mm in dia, with 8–15(20) florets. Involucral bracts linear to almost lanceolate, greenish, glandular-floccose on outer side, sometimes only in lower part, with usually 2–4 small subulate pales at base. Corolla whitish, 8.5–11 mm long, its tube two-fifths to a half as long as, oblong or narrowly campanulate limb, limb incised usually up to a third, less often almost to middle, into narrow, lanceolate teeth with long, acute apices; basal appendages of anthers elongated. Achenes light brown, 6–8 mm long; pappus white, as long as achene or half as long. Flowering July to August; fruiting from September.

Thin coniferous and small-leaved forests, rarely in pine woods in the Far East also in oak forests, shrubby thickets in river valleys, forest and riverine meadows; in mountains along river valleys in forest zone, in places ascending to lower part of alpine zone.—*Arctic*: Anadyr (at the southern boundary of the region); *European part*: Dvina-Pechora (in the west, barely crossing the Severnaya Dvina River), Volga-Kama,

Trans-Volga (rarely, western part); *Western Siberia*: Ob Region, Irtysh (eastern part), Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Lena-Kolyma, Dauria; *Far East*: Kamchatka (including Commander Islands), Okhotsk, Zeya-Bureya, Uda River Area, Ussuri, Sakhalin (Sakhalin and southern Kuril Islands). *General distribution*: Mongolia (north), China (northeast), Korea, Japan? Described from Siberia. Type in London.

Hybrids of *C. hastata* L. \times *C. kamtschatica* (Maxim.) Kudo. (= *C. auriculata* Hultén (non DC.) \times *C. hastata* L. (Hultén), *Fl. Kamtsch.* IV (1930) 195, Fig. 7c-f, excl. synonym.) collected in Kamchatka on the Koryatskaya River and in the interfluvium of the Gorelaya and Bolshaya Topolevaya rivers are intermediate forms between the above species, inclined more toward *C. kamtschatica*; the middle cauline leaves are shaped more like the leaves of *C. kamtschatica* but with longer, acuminate, and somewhat narrower lobes; the upper ones are more like the corresponding leaves of *C. hastata*. The leaves in both the cases are more or less uniformly toothed or with irregular teeth, but not as sharply as in *C. kamtschatica*; the petioles have very weakly developed auricles or are without them; the inflorescence is dense, paniculate of several crowded, long branches, the capitula are large as in *C. hastata* but with fewer involucral bracts (5–7) and flowers; the shape of the corolla is like that of *C. kamtschatica*; the achenes are undeveloped.

Note 1. Hultén (op. cit.) placed *Calcalia auriculata* α . *ochotensis* Maxim. in the synonymy of this hybrid form. Meanwhile, Maximowicz considered his own combination *Senecio davuricus* α . *ochotensis* Maxim. as the type form of *Calcalia auriculata* DC. (*Senecio davuricus* Sch. Bip.), a species broadly interpreted by him. At the same time, 689 Maximowicz made the combination *Senecio davuricus* β . *kamtschatica* Maxim. for the species later called *Cacalia kamtschatica* (Maxim.) Kudo. The name *C. auriculata* DC. was used invalidly by Hultén for *C. kamtschatica* (Maxim.) Kudo, whereas it is clearly indicated in the work of De Candolle that *C. auriculata* was described by him from the plant collected between "Yakutia and Okhotsk," which he received from Turczaninow who determined it as *Ligulatia* [sic.; recte *Ligularia*] *auriculata* Turcz. In the herbarium of the Botanical Institute of the Academy of Sciences of the USSR, there are four sheets from I. Kuznetsov's collections in 1835 from the Urak River (Okhotsk District), all of which bear the annotation "*Ligularia auriculata* Turcz." written in Turczaninow's own hand. There is hardly any reason to doubt that these specimens are duplicates of the type of *C. auriculata* DC. They all conform fully to the description given by De Candolle for *C. auriculata*.

Note 2. Given that *C. hastata* is not always distinguished from the Japanese geographic races of the series *Robustae*, the question of the

occurrence of this species in Japan still remains unresolved. Kitamura (1. c.) does not report this species for Japan, which he considers as the type subgenus of the aggregate species *Cacalia hastata* s. l. However, in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR, there is a wholly typical specimen of *C. hastata* (glabrous form) from the herbarium of Sakurai, on whose label it is mentioned that it was collected from the north of Honshu Island (Mutsu Prefecture, city of Iwakisan).

Series 2. Robustae Pojark.—Capitula numerous, up to 200–350, aggregated in rather large, lax, strongly branched, pyramidal panicles, 60 cm long, with branches in form of many-flowered panicles; involucre narrow, cylindrical or campanulate-cylindrical with (4)5–7(8) involucre bracts, at base without involucre bracts. Flowers in capitulum 5–7(10); corolla tube narrow $1/4 - 1/3$ as long as limb; limb narrow, campanulate-tubular, cut a fourth to a third of the length into 5 narrowly deltoid teeth. Tall plants, up to 2–3 m high, with large, hastate leaves; cauline leaves few, up to 60 cm wide, their lateral lobes broad, mostly bifid.

The series *Robustae* includes the following four Far Eastern species, of which two, *C. robusta* Tolm. and *C. komaroviana* (Pojark.) Pojark., penetrate the USSR boundaries, but *C. aidzuensis* Koidz. and *Cacalia tschonoskii* Koidz. are endemic to Japan. Species of this series, still not studied, are also found in western and central China.

2. **C. robusta** Tolm. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 237.—*Cacalia hastata* auct. non L. (1753): Fr. Schmidt. Fl. Sachal. (1868) 151.—*Senecio sagittatus* β . *glaber* Maxim. in Bull. Acad. Sc. Pétersb. XIX (1874) 483 p. p.; Mém. biol. IX, 293 p. p. (quoad pl. jap.).—*Cacalia hastata* β . *glabra* auct. non Ldb. (1833): Maxim. in sched. Matsum. Ind. pl. jap. II, 2. Dicotyl. 633, p. max. p. 690 Kudo in Bot. Mag. Tokyo, XXIX, 229 (excl. area Honsiu); Hara in Bot. Mag. Tokyo, LII, 66 p. p. (quoad pl. Jap. et excl. synon.).—*C. hastata* ssp. *orientalis* Kitam. in Acta Phyt. Geobot. VII (1938) 244 p. p. (excl. synon. praeter 1, 6); Compos. Japon. III, 216 p. p.; Sugaw Ill. fl. Saghal. IV, 1843; Hara, Enum. Spermatoph. Japon. 149 p. p. (quoad syn. 1, 6); ?Tatewaki in Acta hort. Gotoburg. XXI (1952) 112.—*C. hastata* var. *orientalis* Ohwi, Fl. Japon. (1953) 1177.—*Hasteola robusta* Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960) 381.—*Synosma robusta* Pojark. olim in Sched.—**lc.**: Sugaw. op. cit. tab. 845; Tolm. op. cit. Fig. 1; Pojark. op. cit. Fig. 4.

Perennial. Plant tall, up to 2.5–3.0 m high, with creeping rhizome. Stem in lower part thick, straight, in upper part slender, more or less bent, glabrous or hairy below inflorescence, sometimes densely hairy

with short thickish hairs. Leaves glabrous above, with flexuous hairs along veins beneath, sometimes entirely pubescent; lower leaves deltoid reniform, withering early, small; middle leaves up to 35 cm long and 40 cm wide, deltoid or almost hastate, with broad base, and attenuate, short-acuminate middle lobe, and small, oblong-deltoid, undivided acuminate, lateral lobes; leaf margin usually convex, sinuate-toothed, with sharp-pointed teeth; petioles broadly winged, auriculate with auricles a third to two-thirds as long as lamina; leaves in upper part of stem sharply reduced in size, deltoid or deltoid-hastate, usually with small, acute lobes or oblong-ovate, without lobes. Panicle up to 50 cm long, with up to 200(300) capitula, and long, slender, mostly floccose, acutely divergent branches bearing capitula usually only above middle; peduncles of last order 3–12 mm long, mostly floccose, pales narrowly linear to broadly lanceolate. Involucre campanulate-cylindrical, 9–10(12) mm long, consisting of (5)6–8 linear and lanceolate-linear, green, glabrous or weakly floccose, involucre bracts. Florets in capitulum 7–10(12); corolla violet-grayish, 6.0–7.5 mm long, with its tube about a third as long as campanulate limb; limb up to a third cut into narrowly deltoid teeth. Achenes 6–8 mm long; pappus brownish. Flowering July to August; fruiting from middle of September.

Tall-grass thickets in valleys, alder thickets and willow stands, and also wet slopes of lower mountain zone.—*Far East*: Sakhalin (southern part of Sakhalin Island); according to reports of Japanese botanists also found on Kuril Islands. *General distribution*: Japan (Hokkaido Island, and, according to Japanese sources, in northern part of Honshu Island). Described from vicinity of the town of Dolinsk from "Kholodnaya Dolina" [Cold Valley]. Type in Vladivostok; topotype in Leningrad.

Note. A.I. Tolmatchev (op. cit. 244) reports that he observed forms on Sakhalin Island in which the characters of *H. hastata* and *H. robusta* are incorporated in varying combinations. Given the absence of
691 direct phyletic links between these two species, such forms, if, of course, their existence were to be proved by actual collections, could be considered only as interspecific hybrids. I did not find such forms in the herbarium material of the Botanical Institute of the Academy of Sciences of the USSR.

3. ***C. komaroviana*** (Pojark.) Pojark. comb. nova.—*Cacalia farfaraefolia* α. *ramosa* auct. non Maxim. (1874): Kom. Fl. Manchzh. III, 689 (excl. synonym. and area Japon.); Nakai Fl. Korean, II, 35; Fl. sylv. Korean. XIV, 106.—*C. farfaraefolia* auct. non Sieb. and Zucc. (1846): Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1053.—*C. hastata* ssp. *orientalis* Kitam. in Acta Phyt. et Geobot. VII (1938) 244,

p. min. p. (quoad synon. Kom.); Compos. Japon. III, 216 p. p. (quoad areas Korea and Mandsch.).—*Hasteola komaroviana* Poljark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960) 381.—*Synosma komaroviana* Pojark. olim in sched.—**Ис.**: Pojark. loc. cit. Fig. 5, 6.

Perennial. Plant robust with creeping rhizome covered with numerous, thickish adventitious roots. Stem (0.7)1–2 m high, 8–12 mm thick at base, slender above, bent, sulcate, glabrous or with very sparse hairs, but floccose below capitulum, with crisped glandular hairs. Lower leaves withering much before anthesis, middle cauline leaves 20–35 cm long, 25–50 cm wide, triangular, higher ones deltoid-hastate, apex rather shortly narrowed but often caudate, lateral lobes usually bilobed, with long, acuminate secondary lobes and broadly sinuate base decurrent on petiole, sinuate, sometimes irregularly toothed, teeth abruptly narrowed into thin, acute apices, bright green above, somewhat lighter, dull beneath, sparsely hairy on both sides with very short hairs; petiole a third to a half as long as lamina, broadly winged (up to 1.5–2.0 cm wide), at base expanded into large amplexicaul auricles; leaves gradually reduced above, lower of the upper cauline leaves sometimes of same form as middle cauline leaves but more often narrower (more or less as long as wide), deltoid-hastate, with shallow-two-lobed or undivided lateral lobes and toothed margin. Capitula numerous, up to 250–300, aggregated in large, 20–50 cm long, strongly branched pyramidal panicle inflorescence, lower branches long, up to 22 cm, ascending, upper upward-spreading, all branched, with spreading branchlets; lower bracteal leaves mostly remote, narrowly deltoid-hastate or oblong, more or less large, upper leaves narrowly linear, small, 2–5 mm long and 0.3–1.5 mm wide; peduncles of capitula usually slender and long, 8–12 mm long or some shorter (4–6 mm long), borne in axils of almost filiform bracteal leaves; 3.5 mm long, bearing 1–2 smaller leaves; main axis and peduncles covered with usually very dense, short, curly, later partly arachnoid, glandular hairs. Involucre narrowly cylindrical, of 5 involucre bracts; involucre bracts 9–12 mm long, at flowering three-fourths as long as pappus, linear-oblong, green, sparsely glandular-pubescent on outside. Flowers in capitulum (3)5–7; corolla 7–8 mm long, its tube 1.5–2.0 mm long, (1/4)2/7–1/3 as long as upper, narrow, almost tubular limb; anthers about 3 mm long, with deltoid, 0.4–0.5 mm long apical appendages and 0.3–0.5 mm long basal appendages; style branches long, hairy on outer side up to upper one-third. Achenes 6–8 mm long, pappus white, about 7 mm long.

Dense mixed and coniferous, chiefly montane forests on slopes and stony places in valleys of rivers and streams.—*Far East*: Ussuri (southern region). *General distribution*: China (northeastern part), Korea. Described from Changhua Tsailin Range between towns of Omoso and Girin. Type in Leningrad.

Note. Morphologically, *C. komaroviana* is closest to the Japanese species *C. tschonoskii* Koidz. and is distinguished from the latter by the following characters: broader leaves with a less attenuate middle lobe and broad, rather deeply bifid lateral lobes, broadly winged petioles expanded at the base into large auricles (rather than narrowed toward the base and lacking auricles, or, in rare cases, with small auricles), corolla with a longer tube and wider limb and a slightly yellowish rather than snow-white pappus of the achenes.

Series 3. Auriculatae Pojark.—Inflorescence simple raceme or panicle, on lateral branches capitula aggregated into simple raceme; involucre narrowly cylindrical, consisting of (4)5 involucre bracts; florets in capitulum (4)5–7(8); corolla tube as long or up to a half to two thirds as long as campanulate limb; pappus of achenes white. Plants 30–150 cm high, with reniform or deltoid reniform, up to 16(25) cm wide leaves; petioles at base with auricles.

The following three eastern Asian species belong to this series.

4. **C. praetermissa** (Pojark.) Pojark. comb. nova.—*Senecio davuricus* α. *ochotensis* Maxim. in Bull. Acad. Sc. Pétersb. XIX (1874) 485; Mém. biol. IX, 296, p. min. p.—*Cacalia auriculata* α. *ochotensis* Kom. Fl. Manchzh. III (1907) 688 p. p.; Nakai, Fl. Korean. II, 35; in Bull. Nat. Sc. Mus. XXXI, 114; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1044 p. p.—*C. auriculata* var. *alata* Nakai, Veget. m. Waigalbon (1916) 73; Fl. sylv. Korean. XIV (1923) 106.—*C. auriculata* auct. non DC. (1837); Kitam. Compos. Japon. III (1942) 209 p. p. (quoad pl. korean. and excl. synom.); Hara, Enum. Spermatoph. Japon. II (1952) 147 p. p. (quoad pl. korean.); Tolm. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII, 240, p. min. p. (quoad pl. austro-ussur.).—*C. auriculata* var. *kamtschatica* auct. non Matsum. (1895): Kitam. op. cit. 210 p. p. (quoad pl. korean.) cum f. *alata* Kitam.; Hara, op. cit. 147 p. p.—*Hasteola praetermissa* Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960) 386.—**lc.**: Pojarkova, op. cit. Figs. 7, 8.

Perennial. Rhizome oblique or horizontal, short, 5–15 mm thick, densely covered with slender, filiform adventitious roots; stem 50–150 cm high, about 5(8) mm thick at base, gradually becoming thinner above and 1–2 mm thick below inflorescence, sulcate-ribbed, stiff, bent at nodes only upper part and often with very short, 1–3 cm long internodes (middle internodes 8–15 cm long), densely leafy, particularly in upper part, green or with red stripes, glabrous or with occasional short hairs. Lower 1–2 leaves much smaller than middle cauline leaves, reniform, with long petioles up to twice as long as lamina, withering early; middle leaves 3–4, 7–15 cm long and (12)15–24 cm wide,

strongly expanded, reniform or less often deltoid-reniform, usually with deeply sinuate or almost hastate base, sinuate-toothed, often irregularly toothed, apically usually abruptly narrowed into large acute tooth and with 2(3) pairs of such teeth below, but sometimes with few teeth in upper part as well (and in that case similar to leaves of *C. kamtschatica*); bright- or dark-green above, lighter and glaucous beneath, on both sides glabrous, matte; petioles mostly a fourth to a half as long as lamina, less often $2/3$ or up to $1/8$ as long and along margin more or less broadened, often broadly winged, up to 1.0–1.5(2.0) cm wide, always with amplexicaul auricles, usually large; 1–2 upper cauline leaves sharply reduced in size, $1/3$ – $2/3$ as long as middle leaves, deltoid or reniform-deltoid, with truncate or cuneate base, usually with 3 large teeth or almost 3-lobed. Capitula drooping, numerous, aggregated into lax, less often compact, oblong, often almost cylindrical, paniculate (only in weak plants almost racemose) inflorescence, 18–32 cm long and 5–9 cm wide, branched almost up to apex, less often only in lower half; branches (1.5)2–7 cm long, lower branches up to 10 cm long, always shorter than main axis, obliquely upright, bracteal leaves (3)8–20 mm long, lanceolate-linear, upper setaceous, only lowermost leaves sometimes larger, resembling upper cauline leaves; peduncles of capitula slender, 3–8(11) mm long, with 2–4 setaceous leaves 1.5–2.5 mm long. Capitula with 5–8 florets. Involucre narrowly cylindrical; involucre bracts 5, narrowly linear, green, less often reddish, (6)8–11 mm long and 1.0–1.5(2.0) mm wide. Corolla at flowering time projects from involucre by half the length of its limb, 8.5–9.5 mm long; corolla tube as long as limb or up to $2/3$ as long. Achenes (immature) 6 mm long, brownish, pappus white, 7–8 mm long. Flowering August.

694 Mixed and coniferous forests in moist places, along banks of rivers and streams, solitary or in groups, frequent.—*Far East*: Ussuri (southern district). *General distribution*: China (Girin Province and Korea). Described from the south of Primorsk [Pacific Coastal] Territory, from Suchan River basin. Type in Leningrad.

Note. Besides the larger size of the plant and all its parts, *C. praetermissa* differs from *C. auriculata* also by the following characters: a densely leafy stem, leaves that in shape and size are quite similar to the leaves of *C. kamtschatica*, sometimes even developing (like this species) several large, lobate, acute teeth on the upper margin, almost always broadly winged petioles, involucre bracts that are longer in absolute terms as well as in relation to the length of the corolla and the pappus, and also by the paniculate inflorescence with many lateral branches. Between the ranges of *C. praetermissa* and *C. auriculata*, there is a discontinuity; our species is known in the north only as far as Voroshilov and in the Primorsk [Pacific Coastal] Territory—as far as Valentine Bay.

5. **C. auriculata** DC. Prodr. VI (1837) 329; Ldb. Fl. Ross. II, 626 p. p. (excl. pl. kamtsch); Trautv. and Mey. Fl. ochot. 56; Maxim. Prim. fl. amur. 165; Fr. Schmidt in Mém. Acad. Sc. Pétersb. VII, XII, 2, 51, 151 p. p.; Kitag. Lineam. fl. Manshur. 441 p. p.; Sugaw, Ill. fl. Saghal. IV, 1845; Kitam. Compos. Japon. III, 209 p. p. (excl. area Korea et var. *kamtschatica*); Tolmatch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII, 239 p. max. p.—*Ligularia auriculata* Turcz. in sched.; DC. Prodr. VI (1837) 329, pro syn.—*Senecio dahuricus* Sch. Bip. in Flora (1845) 499, non Fisch.—*Senecio davuricus* α. *ochotensis* Maxim. in Bull. Acad. Pétersb. XIX (1874) 485 p. max. p.; Mém. biol. IX, 296, p. max. p.—*Cacalia auriculata* α. *ochotensis* Kom. Fl. Manchzh. III (1907) 688 p. p.; Kudo in Bot. Mag. Tokyo, XXIX, 224 (excl. area Korea); Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1044 p. p.—*Hasteola auriculata* Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960) 391.—**lc.**: Sugaw. Ill. fl. Saghal. IV, tab. 1844a; Pojarkova, loc. cit. Fig. 10.—**Exs.**: Karo, Fl. amur. et zeaëns. No. 126.

Perennial. Rhizome creeping, oblique, short, densely covered with slender, filiform adventitious roots; stem 30–100 cm (less often slightly more) high, slender, 1.5–2.5(4.0) mm thick at base, ascending, often paniculate, tapered above, very slender below inflorescence, sulcate, glabrous, sparsely leafy because leaves up to a half as long as internodes or as long sometimes slightly longer; cauline leaves 4–6, thin chartaceous in herbarium, bright green above, lighter beneath, glaucous, lustrous, glabrous or less often with sparse, short, thickish hairs; lower 1–2 leaves usually much smaller than upper, reniform, strongly expanded, 2–4 cm long and 4.0–9.5 cm wide, abruptly narrowed into long acuminate tip or sometimes emarginate, along margin sinuate and often irregularly toothed, with long, slender, petioles up to 1.5–2(3) times as long as lamina, expanded only at base and usually not forming
 695 auricles; middle cauline leaves 5–10 cm long and 7–14(16) cm wide reniform and up to twice as long as wide, to deltoid or roundish-reniform, with deeply divided base or partly deltoid or roundish-deltoid, with weakly notched or truncate base, often angular and then besides terminal long acuminate large teeth, both sides with 1–2 similarly long-lobular teeth in lower part of lamina or near its base, along margin coarsely sinuate-toothed to indistinctly remotely toothed or partly entire with slender petiole almost as long as lamina or a fourth to a half as long, usually broadened only at base into small auricles (less often auricles up to 1.5 cm long); upper leaves with short petiole, (1/8)1/6–1/3 as long as lamina, sometimes resembling middle leaves but often greatly reduced and different in shape, deltoid and oblong-ovate; uppermost leaves often lanceolate, sometimes with undeveloped branch of inflorescence or capitula in axils. Inflorescence cylindrical, very

lax, narrow, (3.5)4.5–15(23) cm long and 2–5 cm in dia, usually a simple raceme, less often with few, short, 2.5–4.0 cm long branches in lower part with raceme of few capitula. Capitula with 4–7 florets, drooping, on slender peduncles, 1.5–5.0 mm, lower ones 7–9 mm long, covered with very small capitate glands and very short, simple, straight hairs. Bracteal leaves usually small (2 mm long), subulate or narrowly lanceolate, only lowermost sometimes 1–3 cm long. Involucre narrowly tubular, purple, or less often greenish-purple to green, at anthesis almost a half as long as florets; involucre bracts 5, less often 4, oblong (4)5–8(9) mm long. Corolla 6–8 mm long, its tube sometimes as long as limb but, most often, slightly shorter (less often up to half). Achenes light-colored, yellowish, 3.5–5.0 mm long; pappus white, about 1.5 times as long as achene. Flowering second half of May to July; fruiting September.

Dark coniferous, mixed and birch forests, mainly in valleys, coastal scrub thickets, quite wet clearings, grassy areas, solitary or in groups.—*Far East*: Okhotsk, Zeya-Bureya, Uda River Area, Ussuri (only more northern part of Primorsk [Pacific Coastal] Territory, in the south up to Olga Bay), Sakhalin. *General distribution*: China (northeastern part). Described from Okhotsk Region. Type in Paris; duplicates of type in Leningrad.

Note. *C. auriculata* should be dropped from the flora of Kamchatka Peninsula. The specimens from Korf Bay, which Tolmatchev (op. cit. 240) was inclined to refer to this species, must be referred to *C. kamtschatica* on the basis of their characters.

Cf. also Note 1 to *C. hastata*.

6. ***C. kamtschatica*** (Maxim.) Kudo. in Journ. Coll. agric. Hokkaido univ. XII (1923) 60; Kom. Fl. Kamch. III, 175; Sugaw. Ill. fl. Saghal. IV, 1485; Vorob. in Tr. Dalnevost. Fil. Akad. Nauk SSSR, III(V), 696 75.—*C. suaveolens* auct. non L. (1753): Georgi, Besch. Rs. Reichs. III, 5 (1800) 1229.—*C. auriculata* auct. non DC. (1837): Ldb. Fl. Ross. II (1844–1846) 627 p. p. (quoad pl. kamtsch.); Fr. Schmidt. in Mém. Acad. Sc. Pétersb. VII, XII, 2 (1868) 151 p. p.—*Senecio davuricus* β. *kamtschaticus* Maxim. in Bull. Acad. Sc. Pétersb. XIX (1874) 486; Mél. biol. IX, 196; Miyabe, Fl. Kuril. (1890) 244.—*C. auriculata* var. *kamtschatica* Matsum. Shokubutsu Mei-i (1895) 56; Kom. Fl. Manchzh. III, 688; Koidz. in Journ. Coll. Sc. univ. Tokyo, XXVII, 121; Kudo, Fl. Param. 170; Kitam. Compos. Japon. III, 210 p. p. (excl. pl. korean.); Hara, Enum. Spermatoph Japon. 147; Tatewaki in Acta Hort. Gotoburg. XXI, 112.—*C. auriculata* Hultén, Fl. Kamtch. IV (1930) 194, non DC. (1837); Fl. Aleut. 332.—*Hasteola kamtschatica* Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX (1960)

391.—*lc.*: Hultén, Fl. Kamtch. IV, Fig. 7a, b; Sugaw. loc. cit. tab. 844A; Pojarkova, loc. cit. Fig. 9.

Perennial. Rhizome up to 1 cm thick, creeping, short, sometimes with 1–2 branches, densely covered with rather slender filiform, adventitious roots; stem 60–120 cm high, at base 2–7 mm thick, stiff, bent at nodes, ribbed-sulcate, up to inflorescence glabrous or at base sparsely arachnoid-hairy, green or with violet-red stripes, usually sparsely leafy because leaves roughly as long as internodes, less often upper leaves up to 1.5–2 times as long; basal leaves scaly; lower cauline leaf usually 1 (rarely 2), smaller than middle leaves, withering long before flowering, with long petiole slightly broadened toward base and lacking auricles; middle cauline leaves 3–4, up to 15 cm long and 25 cm wide, reniform, deeply notched to almost truncate at base, apically usually round (rarely emarginate), mostly strongly attenuate into large acute tooth, along margin usually with a few (5–8), similar, large, sometimes lobed teeth separated from each other by several smaller, acute unequal teeth, dark green and glabrous above, lighter and glabrous beneath or along veins weakly crisped-hairy, matte, chartaceous or white when dry, dense; petiole $10/13-1/2$ as long as lamina, slender, not winged very rarely expanded in upper part from decurrent base of lamina, usually with small, about 0.5 mm long auricles, less often auricles larger, up to 1 cm long; upper cauline leaves very gradually reduced in size, often almost as long as middle leaf, deltoid-reniform, deltoid or reniform lower 1–3 bracteal leaves similar to upper cauline leaves but sometimes smaller. Capitula drooping, numerous, aggregated in compact, branched panicle (only in weaker plants almost racemose), oblong-ovoid, less often short-cylindrical, up to 16–25 cm long, but mostly shorter, 8–12 cm long; inflorescence branches ascending, almost parallel to main axis, not less than a half as long, often almost reaching same level as of inflorescence with its tip; peduncles of capitula somewhat thick, short, 1.5–3.0(5.0) mm long (less often lower ones 7–10 mm long), $1/5-2/5$ as long as involucre, in axils of narrowly linear or almost filiform leaves exceeding them, and with 1–2, less often 3–4, similar or smaller leaves; axil, and peduncles usually densely covered with flexuous short or somewhat long and then arachnoid hairs and very small glands. Involucre narrowly cylindrical; involucre bracts (4)5, narrowly oblong to linear, lustrous, pale green, (6)8–11(12) mm long, up to flowering as long as corolla and pappus, later about $2/3$ as long. Capitulum 4–7 flowered, corolla 7–9 mm long, its tube $2/3$ as long as limb; limb lobed up to $1/3-1/2$ into narrowly deltoid, long-acuminate teeth. Achenes about 6 mm long, finely sulcate; pappus almost as long as achenes. Flowering August to first half of October; fruiting October.

In thickets of alder (*Alnaster fruticosus*) and forests, mainly dark coniferous forests in the valleys, in shady wet sites, in places frequent to abundant.—*Far East*: Kamchatka, Commander Islands, Okhotsk(?), Sakhalin, south and west and Kuril Islands. *General distribution*: Japan (Hokkaido Island); western Aleutian Islands. Described from Kamchatka. Lectotype in Leningrad.

Note. The report of *C. kamtschatica* on the continent south of Kamchatka needs to be confirmed by new collections. In the Herbarium of the Botanical Institute of the Academy of Sciences of the USSR, there are only two old specimens from the Okhotsk Region: one collected along the Urak River by I. Kuznetsov in 1835 and another from the herbarium of Stubendorf.

GENUS 1562. *Syneilesis* Maxim.^{1, 2}

Maxim. Prim. fl. amur. (1859) 165, tab. VIII, fig. 9–18.—*Senecio* sect. *Cacalia* Benth. in Benth. and Hook. f. Gen. pl. II (1873) 449 p. p.—*Cacalia* auct. non L. (1753): Hoffman in Pflanzenfam. IV, 5 (1894) 296 p. p.

All flowers in capitula tubular, fertile, with regular white-reddish corolla bearing 5 teeth; involucre narrow, usually with 5 unequal involucre bracts, inner[outer] bracts broader and covering with their edges much narrower outer[inner]; common receptacle flat, glabrous, alveolate; anthers sagittate with short, acute, auriculate, fertile appendage; antheropodium somewhat broader than filaments; style branches long, at apex with deltoid acute appendage, depressed on
698 inner side, hairs outside in upper part. Achenes terete, monochromatic, glabrous, with several fine ribs, with one longitudinally twisted, cordate, slightly lobate cotyledon; pappus of numerous, fine, scabrous hairs. Perennial herbs, with one basal, palmatisect, shield-shaped, long-petiolate leaf, with lamina until opening inclined downward and folded like closed umbrella. Capitula small, aggregated in corymbose or paniculate inflorescence.

Types of genus: *S. aconitifolia* Maxim.

The genus includes five species distributed in the countries of Southeast Asia: Korea, northeastern China, Japan, and Taiwan.

1. *S. aconitifolia* Maxim. Prim. fl. amur. (1859) 165; in Mél. biol. IX, 299; Kitam. Compos. Japon. III, 170.—*Cacalia aconitifolia* Bge.

¹Treatment by A.I. Pojarkova.

²From the Greek word *syneileo*—to roll up, because of the convolute cotyledons.

Enum. pl. Chin. bor. (1831) 37; Kom. Fl. Manchzh. III, 165; Nakai, Fl. Korean. II, 34; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1044.—*Senecio aconitifolius* Turcz. in Bull. Soc. Nat. Mosc. X (1837) 155.—**lc.**: Maxim. Prim. fl. amur. tab. VIII, figs. 8–13; Kom. and Alis. op. cit. Plates 312 and 313 (leaf-hand figure).—**Exs.**: Karo, Pl. amur. et Zecens. No. 68.

Perennial. Rhizome short, woody, creeping, with thick adventitious roots; stem 70–120 cm high, glabrous, finely sulcate, purple. Basal leaf 1, withering before flowering; cauline leaves 2, remote, lower with long, up to 30–50 cm long, glabrous, petiole, with short, expanded base clasping stem, lamina roundish, coriaceous, glabrous but initially floccose, 20–30 cm wide, divided up to base into 7–9 lobes deeply incised into linear secondary lobes, with remote long, acute, teeth, other leaf with shorter petiole and smaller lamina, with 4–5 lobes, higher leaves sessile, lanceolate or linear, gradually reduced upward. General inflorescence large, compressed, compound corymb, with lateral branches bearing capitula only near apex; capitula numerous, crowded, on 5–20 cm long peduncles, with subulate, short bracteal leaves at base. Bracts at base of involucre, 3–4, narrow, linear, 3–5 mm long; involucre cylindrical, later campanulate; involucre bracts 5, 9–12 mm long, green or usually purple, glabrous, acute. Corolla about 10 mm long, white-reddish, with narrowly campanulate limb, slightly longer than tube; anthers usually purple. Achenes 5–6 mm long, narrow, terete, sulcate; pappus twice as long as achene, whitish-rusty. Flowering second half of July to August; fruiting first half of September.

Dry slopes, meadows with sandy soil, forest edges, pine groves.—*Far East*: Zeya-Bureya (southeastern part), Ussuri. *General distribution*: China (northeastern part), Korea. Described from Amur. Lectotype in Leningrad.

L. Sp. pl. (1753) 866.

Capitula with single-rowed involucre having involucre bracts of equal length or with one more row of usually much smaller bracts at base, less often as long as inner bracts. Capitula solitary, few, or several on stem forming corymbose, umbellate, paniculate or (less often) racemose inflorescence. Receptacle glabrous, flat. Peripheral florets pistillate, ligulate, one-rowed, yellow, orange, purple, or violet; often

¹Treatment by B. Schischkin.

²From the Latin word *senex*—old; the floral heads in many species are without peripheral ligulate florets; therefore, they appear “bald.” As the flowers wither, the receptacle becomes glabrous or “bald.”

ligulate florets absent, central florets (disk florets) bisexual, tubular, their anthers obtuse at base; style branches truncate and bearing corona of erect hairs near apex. Achenes terete, glabrous or pubescent, with 5–10 longitudinal fine ribs, apically obtuse, with many-rowed pappus of white serrate hairs considerably longer than achene, very rarely pappus lacking. Perennial, annual or biennial herbs (in the tropics often as shrubs or trees) with simple pinnate or less often bipinnate or ternate; or undivided, usually with toothed, alternate leaves.

The genus includes about two thousand species distributed throughout the world, particularly in South Africa, the Mediterranean floristic region, and in temperate Asia and America.

1. Plants annual, very rarely biennial 2.
- + Plants perennial 11.
2. Plants glandular-pilose, sticky; achenes glabrous, less often weakly pubescent between ribs 3.
- + Plants arachnoid-hairy or subglabrous, not glandular pilose; achenes densely appressed-hairy 4.
3. Plants usually strongly branched; leaves often simple pinnate; capitula 6–8 mm long; achenes glabrous 92. *S. viscosus* L.
- + Plants usually weakly branched; leaves often twice pinnate; capitula 8–10 mm long, peduncles longer; achenes weakly pubescent and glandular-pilose between ribs 93. *S. calvertii* Boiss.
4. Ligulate florets entirely absent 5.
- + Ligulate florets always present, numerous or few (two to three) 6.
5. Leaves pinnately lobed, with broadly toothed lobes, 3–10 cm long and 1.5–4.0 cm wide; achenes 2.0–2.5 mm long; plant 15–50 cm high; capitula on short peduncles in compact corymbose panicle 94. *S. vulgaris* L.
- + Leaves sinuate-toothed, less often pinnately lobed, 2–5 cm long and 0.3–1.0 cm wide, with narrow (1–3 mm wide), mostly undivided lobes; achenes 3.0–3.5 mm long; plants 3–20 cm high; capitula on long peduncles in depanurate inflorescence 95. *S. dubius* Ldb.
6. Ligules of peripheral florets very small, scarcely longer than involucre, involute 7.
- + Ligules of peripheral florets flat, not involute, horizontally spreading or decurved, considerably longer than involucre 8.
7. Stem 25–70 cm high, branched from middle or only above; involucre 6–8 mm long; ligulate florets 8–14 (European part of the USSR) 96. *S. sylvaticus* L.

- + Stem 8–25 cm high, usually branched from middle; involucre 4–6 mm long; ligulate florets 2–7 (Pamiro-Alai Region and Tien Shan) 97. **S. krascheninnicovii** Schischk.
- 8. Short, 3–15 cm high, high-mountain plants, usually strongly arachnoid-hairy, with numerous stems (Caucasus) 99. **S. sosnovskyi** Sof.
- + Taller, (5)10–60 cm-high plants, distributed in lower zones, usually weakly pubescent, sometimes almost glabrous; stems 1–5 9.
- 9. Outer involucre bracts turning black in upper part, or almost entire; plants usually arachnoid-hairy; biennial 98. **S. vernalis** Waldst. and Kit.
- + Outer involucre bracts greenish at apex, lacking blackish spot; plants glabrous; annuals 19.
- 10. Leaves pinnate; plants growing on saline soils 102. **S. noeanus** Rupr.
- + Leaves broadly linear, undivided, with few teeth, sometimes almost entire 101. **S. subdentatus** Ldb.
- 11. Stem with single capitulum; usually short (5–25 cm high), alpine or arctic plants 12.
- + Stem with 3 to many capitula 21.
- 12. Plants wholly glabrous 13.
- + Plants more or less pubescent 14.
- 13. Lower leaves twice pinnate or ternate; outer involucre bracts 2–5, linear; achenes 2.5 mm long 52. **S. carpathicus** Herb.
- + Lower leaves lyrate-pinnately divided, terminal lobe oblong with obtusely toothed apices and smaller, entire, lateral lobes; involucre one-rowed; achenes 3.5–4.0 mm long 52. **S. resedifolius** Less.
- 14. Ligulate florets 8–10; basal leaves densely white-tomentose beneath 91. **S. jacuticus** Schischk.
- + Ligulate florets 12–25; leaves more or less pubescent beneath, but not white-tomentose 15.
- 15. Petioles of basal leaves usually 2–7 times as long as lamina; upper half of stem often densely covered with long, soft, white arachnoid hairs or dark purple hairs 16.
- + Petioles of basal leaves shorter than lamina, less often as long 18.
- 16. Stem slender; leaves almost glabrous or sparsely pubescent 87. **S. subfrigidus** Kom.
- + Stem thick, in upper half covered with thin felt of long, tomentose, white or sordid brown hairs 17.
- 17. Ligulate florets dirty-purple; involucre 15 mm long and 25 mm wide, upper half of stem covered with dense tomentum of sordid hairs (Chukotka Peninsula) 83. **S. tichomirovii** Schischk.

- + Ligulate florets yellow; upper half of stem covered with dense tomentum of soft white hairs 84. **S. pricei** Sims.
18. Ligulate florets dark purple or dark orange (mountains of central Siberia) 85. **S. turczaninovii** DC.
- + Ligulate florets yellow or orange 19.
19. Upper half of plant densely pubescent with violet hairs (Arctic) 82. **S. atropurpureus*** (Ldb.) B. Fedtsch.
- + Plants white-pubescent 20.
20. Ligulate florets orange-yellow; achenes pubescent; plants 20–35 cm high (mountains of Kamchatka and Okhotsk) 88. **S. pseudoaurantiacus** Kom.
- + Ligulate florets yellow or slightly orange; achenes glabrous; plant 10–20 cm high 85. **S. turczaninovii** DC.
- 21(11). Involucre two-rowed; outer involucre bracts few or numerous; leaves often coarsely toothed, often lobate as well as simple pinnate or twice pinnate or ternate 22.
- + Involucre one-rowed; leaves always undivided, along margin coarsely or indistinctly toothed or entire 76.
22. Ligulate florets wholly absent 23.
- + Ligulate florets numerous; rarely 1–2 or 3–5 26.
23. Leaves pinnate or lyrate; involucre 7 mm long and 2 mm wide; inner involucre bracts much larger; capitula with numerous tubular florets; plants covered with thin, appressed arachnoid hairs 38. **S. paucilobus** DC.
- + Leaves undivided, lanceolate or reniform-cordate, toothed; involucre 4.5–6.0 mm long and 2.0–2.5 mm in dia 24.
24. Leaves lanceolate, 6–24 cm long and 1–5 cm wide; outer involucre bracts narrowly linear, one-third to half as long as inner, latter 4–6 35. **S. pojarkovae** Schischk.
- + Leaves reniform-cordate, 14–15 cm long and 20–25 cm wide 25.
25. Capitula with 10–15 florets; involucre 8 mm long and 3 mm in dia, inner involucre bracts 7–8; achenes terete, 4–5 mm long 37. **S. platyphylloides** Somm. and Lev.
- + Capitula with 5 florets; involucre 5 mm long and 2–3 mm in dia, inner involucre bracts 4–5; achenes about 3 mm long 36. **S. rhombifolius** (Willd.) Sch. Bip.
26. Ligulate florets in capitulum 1–3(5) 27.
- + Ligulate florets 5–25 29.
27. Ligulate florets in capitulum 1–2; leaves quite large, 40–50 cm long and 12–15(25) cm wide, simple pinnate or bipinnate; achenes pubescent 39. **S. othonnae** MB.

**S. atropurpureus* in the original.—General Editor.

- + Ligulate florets 3-5; leaves 5-10 cm long and 1-3 cm wide; achenes glabrous 28.
- 28. Leaves deeply pinnately divided; inner involucre bracts numerous, with dark violet, almost black, spot at apex (Carpathians) 49. **S. carniolicus** Willd.
- + Leaves ovate, almost entire; inner involucre bracts 8, lacking dark violet spot at apex (Soviet Central Asia) 54. **S. karelinioides** Winkl.
- 29(26). Leaves undivided, usually toothed, less often entire 30.
- + Leaves pinnate, sometimes bipinnate, rarely lyrate 56.
- 30. Leaves with oblong or suborbicular auricles, irregularly toothed with acute, upright teeth 48. **S. litvinovii** Schischk.
- + Leaves without or with weakly developed auricles, usually glabrous beneath, with erect teeth 31.
- 31. Ligulate florets 5(6) 32.
- + Ligulate florets not less than 8 38.
- 32. Capitula with 15-20 florets; involucre obconical, 8 mm long and 4 mm in dia (Caucasus) 43. **S. lapsanoides** DC.
- + Capitula with numerous florets; involucre broadly campanulate, 5-6 mm long and 3.5-6.0 mm in dia 33.
- 33. Root filiform, stem about 50 cm high; leaves 3-10 cm long and 1-5 cm wide 34.
- + Rhizome slender, creeping; stem 60-100 cm high; leaves 15-30 cm long and 4-5-8.5 cm wide 35.
- 34. Ligulate florets only slightly longer than involucre; cauline leaves lanceolate, up to 2.5 cm wide 7. **S. saposchnikovii** Krasch. and Schipcz.
- + Ligulate florets 2-2.5 times as long as involucre; cauline leaves ovate or oblong, up to 5 cm wide 44. **S. quincueligatus** Winkl.
- 35. Leaves glabrous on both sides 36.
- + Leaves short-pubescent along veins beneath or all over 37.
- 36. Stem more or less flexuous; outer involucre bracts 5-6, scarcely shorter or longer than inner bracts; achenes 5 mm long 45. **S. fuchsii** K. Gmel.
- + Stem not flexuous; outer involucre bracts a fourth to a third as long as inner; achenes 3-4 mm long 30. **S. schvetzovii** Korsh.
- 37. Outer involucre bracts 4-6, longer than inner; achenes 4.0-4.5 mm long (Caucasus) 42. **S. propinquus** Schischk.
- + Outer involucre bracts 1-3, a third to half as long as inner; achenes 3 mm long 26. **S. macrophyllus** MB.
- 38(31). Ovaries and achenes pubescent 39.

- + Ovaries and achenes glabrous 41.
- 39. Outer involucre bracts linear, 12–15, a third to half as long as inner; achenes about 5 mm long, hairy only along ribs 29. **S. paucifolius** Gmel.
- + Outer involucre bracts 4–5; achenes about 7 mm long, entirely pubescent 40.
- 40. Leaf lamina at base truncate or cordate, often pinnately divided at base, with remote lobes 23. **S. olgae** Rgl. and Schmalh.
- + Leaf lamina at base cuneately narrowed, never pinnately divided 24. **S. franchetii** Winkl.
- 41. Achenes 6–7 mm long, lustrous 42.
- + Achenes 2.0–4.5 mm long, dull 43.
- 42. Stem fistulose; leaves green above, densely arachnoid-hairy below, whitish, at base with semiorbicular, indistinctly toothed auricles; involucre broadly campanulate, 10–12 mm long and 20–25 mm in dia (Far East) 15. **S. pseudoarnica** Less.
- + Stem solid; leaves without arachnoid-tomentum below, lacking auricles, involucre 15 mm long and 20 mm in dia; ligulate florets 12 25. **S. paulsenii** O. Hoffm.
- 704 43. High-mountain plants, with stems 5–20 cm high, arachnoid-hairy; leaves small with petioles 1.5–4.0 cm long and 0.6–1.2 cm thick, several times longer than lamina 50. **S. tianschanicus** Rgl. and Schmalh.
- + Plants 25–150 cm high, with much larger leaves; petioles shorter than lamina, less often as long or somewhat longer 44.
- 44. Capitula small; involucre 5–8 mm long and 4–7 mm in dia 45.
- + Capitula larger; involucre 8–12 mm long and 10–15 mm in dia 48.
- 45. Leaves sessile, sharply toothed, with teeth directed upward; inner involucre bracts with blackish spot at tip 46. **S. fluviatilis** Wallr.
- + Leaves, at least lower, more or less long-petiolate, with straight teeth; inner involucre bracts lacking blackish spot at tip 46.
- 46. Teeth along leaf margin almost absent; outer involucre bracts 2–4; achenes 2–3 mm long 32. **S. racemulifer** Pavl.
- + Teeth along leaf margin distinct; outer involucre bracts 4–5, as long as inner; achenes 3.0–4.5 mm long 47.
- 47. Teeth along leaf margin small, acute, equal; peduncles glabrous or weakly arachnoid-hairy 40. **S. nemorensis** L.
- + Teeth on leaf margin large, apically obtuse or roundish, not equal; peduncles densely white-pubescent 41. **S. iljinii** Schischk.
- 48(44). Ligulate florets 15 49.
- + Ligulate florets 8–12 51.

49. Involucre 12 mm long; outer involucre bracts 8–10, linear or lanceolate, a half as long as inner or slightly shorter, straight; lamina abruptly or gradually narrowed at base into petiole 20. *S. buschianum* Sosn.
- + Involucre 8 mm long; outer involucre bracts 8–10, linear, usually decurved, a half as long as inner; marsh plants, with hollow, densely leafy stem; leaves narrowly lanceolate, sessile, 10–15 mm long and 1–3 mm wide, sharply toothed with upward-directed teeth 50.
- + Mountain plants with solid stem; leaves ovate or lanceolate, 2.5–10.0 cm wide, toothed, teeth not directed upward 51.
50. Leaves dark green above, lighter beneath and sparsely pubescent 33. *S. paludosus* L.
- + Leaves green above, floccose white-pubescent beneath 34. *S. tataricus* Less.
- 705 51. Stem densely pubescent below. Leaves large; basal and lower cauline leaves ovate, with lamina 25–30 cm long and 10 cm wide; blackish spot at tip of involucre bracts absent 31. *S. umbrosus* Waldst. and Kit.
- + Stem glabrous below or even weakly arachnoid-hairy 52.
52. Outer and inner involucre bracts with blackish spot at tip 53.
- + Involucre bracts lacking blackish spot at tip 54.
53. Leaves oblong, 1.5–3.0 cm wide, almost entire; outer involucre bracts 5–7, linear, almost as long as inner; peduncles subglabrous 21. *S. pseudoorientalis* Schischk.
- + Leaves ovate-lanceolate, 2.5–5.0 cm wide, toothed; outer involucre bracts 8–10, linear or lanceolate, a third to a half as long as inner 22. *S. kolenatianus* C.A.M.
54. Ligulate florets 12; lamina at base sometimes more or less cordate (Carpathians) 19. *S. subalpinus* Koch
- + Ligulate florets 8–10; lamina at base narrowed 55.
55. Inflorescence racemose; leaves subglabrous above; pappus white (Glavnyi [Main] Caucasus Range) 27. *S. racemosus* (MB.) DC.
- + Inflorescence paniculate, leaves pilose above, particularly along veins; pappus brownish (Transcaucasia) 28. *S. thyrsophorus* C. Koch
- 56(29). Leaves twice pinnate or ternate with divergent, linear or oblong terminal lobes 57.
- + Leaves simple pinnate, sometimes lyrate 59.
57. Achenes 3–4 mm long, all densely hispid (Caucasus) 10. *S. schischkinianus* Sof.

- + Achenes 1.5–2.5 mm long, all glabrous; or peripheral achenes glabrous and those of disk florets pilose 58.
- 58. All achenes glabrous; leaves twice pinnately incised (Soviet Central Asia) 10a. **S. ferganensis** Schischk.
- + Peripheral achenes glabrous; achenes of disk florets pilose, leaves thrice pinnately incised 9. **S. borysthenticus** Andrz.
- 59. Achenes pilose, peripheral ones sometimes glabrous 60.
- + All achenes glabrous 65.
- 60. All achenes pilose and with pappus; leaf lobes long and acute; rhizome creeping 61.
- + Peripheral achenes glabrous, lacking pappus; pappus of ligulate florets consisting of few hairs on ovary, detaching readily, leaf lobes short and obtuse or subacute; creeping rhizome absent 6.
- 61. Leaves densely hairy beneath, often grayish-tomentose, pinnately lobed or usually deeply pinnately divided 2. **S. grandidentatus** Ldb.
- + Leaves glabrous or weakly tomentose beneath, deeply pinnately divided 62.
- 62. Stem 20–30 cm high; leaf lobes linear, cartilaginously thickened along margin; achenes 3 mm long (Transcaucasia) 100. **S. polycephalus** Ldb.
- + Stem 40–100 cm high; leaf lobes linear-lanceolate, lacking cartilaginously thickened margin, long and acute; achenes 2 mm long 1. **S. erucifolius** L.
- 63. Ligulate florets 8–10(12), small, 4–5 mm long and about 2 mm wide; plants divaricately branched from middle of stem 8. **S. erraticus** Bertol.
- + Ligulate florets (10)12–25, longer (6–15 mm long) and broader (2.5–4.0 mm wide) 64.
- 64. Capitula large, together with ligulate florets 2–3 cm in dia; ligulate florets 12–15 mm long, usually 15–30, twice as long as involucre 5. **S. ambraceus** Turcz.
- + Capitula 1.5–2.0 cm in dia; ligulate florets 6–10(12) mm long, 12–13(15), slightly or 1.5 times as long as involucre 4. **S. jacobaea** L.
- 65(9). Ligulate florets 5 66.
- + Ligulate florets 8–15 67.
- 66. Achenes 5–6 mm long; leaves pinnatifid, leaf lobes with upward-directed teeth; plants 1–2 m high (Far East) 47. **S. cannabifolius** Less.
- + Achenes 3 mm long, teeth on leaves not upward directed; plants

- 20–60 cm high 7. **S. saposhnikovii** Krasch. and Schipcz.
67. Ligulate florets 8, whole plant white-tomentose except upper surface of leaves; achenes 1.5 mm long (Crimea, cultivated) 11. **S. cineraria** DC.
- + Ligulate florets 10–15 68.
68. Leaves lyrate or panduriform, with 2–5 pairs of deltoid or broadly ovate, sharply toothed lobes, densely white-pubescent beneath (rarely lacking tomentum of glandular hairs); terminal lobe usually cordate or ovate at base 69.
- + Leaves not lyrate, pinnatifid and not pubescent beneath 74.
69. Whole plant short glandular-hairy, disk florets 4-toothed 18. **S. taraxacifolius** (MB.) DC.
- + Plants arachnoid-hairy, lacking glandular hairs; leaves usually white-tomentose beneath 70.
- 707 70. Terminal lobe of lyrate pinnate leaf ovate-deltoid, cordate at base 71.
- + Terminal lobe of leaf truncate at base, not cordate 72.
71. Capitula 2–6; involucre 15 mm in dia (Ciscaucasia and Western Transcaucasia) 17. **S. pandurifolius** C. Koch
- + Capitula numerous; involucre 10–12 mm in dia 16. **S. kubensis** Grossh.
72. Involucre 10 mm in dia; capitula numerous, 10–40 14. **S. massagetovii** Schischk.
- + Involucre 12–15 mm in dia; capitula 2–25 73.
73. Involucre 8–10 mm long; outer involucre bracts 1–3 12. **S. lorentii** Hochst.
- + Capitula up to 25. Involucre 5–6 mm long; outer involucre bracts 2–7 13. **S. lipskyi** Lom.
74. Middle cauline leaves obovate or ovate, 8 cm long and 4–5 cm wide; outer involucre bracts linear-subulate, about 5; ligulate florets 12 51. **S. renardii** Winkl.
- + Middle cauline leaves oblong, 8–20 cm long and 0.5–4.0 mm wide, pinnatifid; outer involucre bracts 2–3, narrowly linear, half as long as inner 75.
75. Inner involucre bracts with quite distinct blackish spot at tip; ligulate florets 10, achenes glabrous, 4 mm long (Soviet Central Asia) 3. **S. korshinskyi** Krasch.
- + Inner involucre bracts lacking blackish spot at tip; ligulate florets 12, yellow; achenes glabrous, 2 mm long. Involucre broadly campanulate, 5 mm long, 6–7 mm in dia; outer involucre bracts linear, 10, considerably shorter than inner bracts 6. **S. argunensis** Turcz.

- 76(21). Stem branched in upper half, usually densely glandular throughout with divergent, multicellular hairs; stem hollow; ligulate florets light yellow, numerous (20–25); pappus at anthesis scarcely longer than disk florets, strongly elongated at fruiting **S. arcticus** Rupr.
- + Stem usually solid (less often hollow); pubescence otherwise; ligulate florets yellow, usually less numerous; pappus not elongated at fruiting 77.
77. Ligulate florets flame-red; high-mountain plants 78.
- + Ligulate florets dark-purple, orange, yellow, or lemon-yellow 80.
78. Involucre 6–7 mm long and 8–10 mm in dia; achenes pubescent, less often glabrous 79. **S. caucasigenus** Schischk.
- 708 + Involucre 10 mm long and 10–15 mm in dia; achenes glabrous 79.
79. Stem (25)30–40 cm high; basal and lower cauline leaves sessile or with very short broad petiole (Carpathians) 78. **S. capitatus** (Wahlb.) Sten.
- + Stem 15–30 cm high; basal and lower cauline leaves with petioles as long as lamina or longer (Dzhungarian Alatau) 80. **S. pyroglossus** Kar. and Kir.
80. Ligulate florets dark purple 81.
- + Ligulate florets orange, yellow, or lemon-yellow 83.
81. Ligulate florets linear, 15–20 mm long and 1–2 mm wide 76. **S. flammeus** Turcz.
- + Ligulate florets shorter and broader, 8–10 mm long and 3 mm wide 82.
82. Achenes pubescent; basal leaves 1–2(3) cm wide (Western Ukraine) 77. **S. besserianus** Mind.
- + Achenes glabrous; basal leaves broader, 2–5 cm wide (Eastern Siberia) 75. **S. porphyranthus** Schischk.
83. Arctic or alpine plants, 10–30 cm high; capitula 2–5, rarely more; ligulate florets often orange 84.
- + Taller plants, 30–100 cm high, usually with many capitula; ligulate floret yellow 86.
84. Ovaries and achenes pubescent; arctic plants 86. **S. tundricola** Tolm.
- + Ovaries and achenes glabrous; alpine plants 85.
85. Rhizome rather thick and long, creeping; stem in upper part and peduncles tomentose-villous (Altai) 29. **S. sumnevicii** Schischk. and Serg.
- + Capitula small; stem in upper part villous-glandular mixed with white [and/or] dark-purple hairs (mountains of Central Siberia).

- 85. *S. turczaninovii* DC.
86. Basal and lower cauline leaves with petioles longer than lamina; lamina cordate at base 87.
- + Lamina attenuate toward base (not cordate) 88.
87. Involucre 10 mm long and almost as much in dia; achenes glabrous (Western Ukraine); stem not hollow 72. *S. rivularis* Waldst. and Kit.
- + Involucre 6–7 mm long and 7–8 mm in dia; achenes hairy; stem hollow 62. *S. cladobotrys* Ldb.
88. Basal and lower cauline leaves roundish-ovate, or broadly ovate, with large teeth 89.
- + Basal and lower cauline leaves oblong, ovate, elliptical, with small, inconspicuous teeth or almost entire 90.
- 709 89. Inflorescence umbellate; capitula on peduncles 2.5–4.0 cm long; involucre bracts dark violet, with blackish tips (Far East) 70. *S. sichotensis* Kom.
- + Inflorescence corymbose, on rather unequal peduncles, 0.5–3.5 cm long; involucre bracts greenish-brown, lacking blackish spot at tip (Altai) 71. *S. veresczaginii* Schischk. and Serg.
90. Achenes glabrous 91.
- + Achenes pubescent 103.
91. Achenes 2.0–2.5 mm long 92.
- + Achenes 3.5–5.0 mm long 94.
92. Involucre bracts densely covered with grayish felt; involucre 10–12 mm long and 12–15 mm in dia. Ligulate florets yellow, 3–4 mm wide 68. *S. aguilonaris* Schischk.
- + Involucre bracts lacking grayish felt 93.
93. Capitula small; involucre 4–5 mm in dia; stem hollow; ligulate florets 12–15 67. *S. sukaczewii* Schischk.
- + Capitula larger; involucre 8–10 mm in dia; ligulate florets 12–20 66. *S. asiaticus* Schischk. and Serg.
94. Ligulate florets often orange, 20–25; achenes 5 mm long 81. *S. karjaginii* Sof.
- + Ligulate florets yellow, 5–15; achenes not longer than 4 mm 95.
95. Plant 20–30 cm high, densely tomentose; ligulate florets 10–15 mm long (Sakhalin) 65. *S. kawakamii* Makino.
- + Plants much taller and subglabrous 96.
96. Ligulate florets egg-yellow (Urals) 69. *S. igoschininae* Schischk.
- + Ligulate florets orange or yellow 97.
97. Involucre bracts blackish-violet; ligulate florets orange 90. *S. reverdattoi* Sobolevsk.
- + Involucre bracts green; ligulate florets yellow 98.

98. Involucre 4 mm long and 6 mm in dia; involucre bracts 12, with long, acute, recurved, and blackish tip 73. **S. hieraciiformis** Kom.
 + Involucre 8–10 mm long and about 15 mm in dia; involucre bracts 20–30, lacking blackish tips 99.
99. Stem almost leafless, 15–30 cm high; ligulate florets about 10; achenes glabrous, 4–5 mm long 74. **S. subscaposus** Kom.
 + Stem leafy, ligulate florets 12–15; achenes 3–4 mm long 100.
100. Achenes hairy; involucre 8 mm long and as much wide; ligulate florets 12–14 (Caucasus) 63. **S. subfloccosus** Schischk.
 710 + Achenes glabrous; involucre 8–10 mm long and about 15 mm wide; ligulate florets 15 (Carpathians) 64. **S. papposus** (Rchb.) Less.
101. Stem hollow; involucre bracts with dark spot at tip 61. **S. lenensis** Schischk.
 + Stem solid; involucre bracts lacking dark spot at tip 102.
102. Basal and lower cauline leaves with petioles shorter than or as long as lamina, rarely slightly longer 103.
 + Basal and lower cauline leaves with petioles 2–3 times as long as lamina 104.
103. Plants floccose-tomentose, later subglabrous, capitula 7–20 (Siberia and northern European part of the USSR) 56. **S. campester** (Retz.)
 + Plants with dense, thin, white tomentum on stem and leaves; capitula 3–7(10) 105.
104. Leaves with remote, very small, blackish teeth; achenes 2.5 mm long 59. **S. amurensis** Schischk.
 + Leaves lacking very small blackish teeth; achenes 3 mm long 58. **S. jalikola** Juz.
105. Plants subglabrous (Kamchatka); capitula 3; involucre bracts 6–7 mm long; achenes 4 mm long 60. **S. succisifolius** Kom.
 + Plants pubescent; capitula 5–15; involucre bracts 4.5–5.5 mm long; achenes 3 mm long 57. **S. czernjavevii** Mind.

Section 1. Jacobaea DC. Prodr. VI (1837) 348; Boiss. Fl. or III, 384; Gord. and Gr. Fl. Fr. II, 112.—Plants perennial or biennial; leaves pinnatisect or pinnatifid, or even lyrate, less often twice pinnately cut, glabrous or tomentose; ligulate florets always present, 10–20, less often fewer, yellow; involucre 2 rowed, outer involucre bracts usually few.

Series 1. Erucifolii (Rouy) Schischk. comb. n.—Subsect. *Erucifolius* Rouy, Fl. Fr. VIII (1903) 335.—Leaves simple pinnate or lyrate, glabrous or weakly pubescent.

1. *S. erucifolius* L. Sp. pl. (1753) 869; Ldb. Fl. Ross. II, 633; Boiss. Fl. or. III, 351 ex parte; Schmalh. Fl. II, 87, var. excl.; Grossh. Fl. Kavk. IV, 154; Kryl. Fl. Zap. Sib. XI, 2842.—*S. jacobaea* Ldb. Fl. Alt. IV, 110, non L.—*S. praealtus* Ldb. Fl. Ross. II, 634, p. min. p. non Bertol.—*S. erucifolius* var. *viridis* Trautv. in Mélang. biol. II (1854) 130.—*Jacobaea erucifolius* Gaertn. May. and Scherb. Fl. Wett. III (1801–1802) 208.—**lc.**: Rchb. Ic. Fl. Germ. (1853) t. 966; Syreistsch. III. Fl. Mosk. Gub. III, 284.—**Exs.**: GRF No. 178.

- 711 Perennial. Rhizome creeping, stem erect, glabrous or weakly tomentose, weakly branched above, sometimes reddish, 40–100 cm high. Basal and lower cauline leaves withering early, glabrous or weakly pubescent, petiolate, lyrate pinnately cut; middle cauline leaves ovate, 5–13 cm long and 2.5–7.0(10.0) cm wide, pinnately cut, with lanceolate or linear, obliquely upright, acuminate lobes; lobes entire or toothed, or divided into few lobes. Capitula numerous, in corymbose inflorescence. Involucre campanulate, 4–5 mm in dia, glabrous or weakly tomentose; outer involucre bracts 5–6, subulate, a half as long as lanceolate inner bracts; ligulate florets yellow, 10–15, oblong, 10 mm long and 2 mm wide; achenes about 2 mm long, ribbed, oblong-terete, hairy in both disk and peripheral florets; all achenes with pappus. Flowering June to August; fruiting September.

Forest edges in birch groves, pine woodlands, birch-aspen forests, scrubs, wet floodplain meadows, gravel beds, alkaline steppes, dry slopes, banks of irrigation canals, less often in standing grain crops.—*European part*: Dvina-Pechora, Baltic Region, Upper Dnieper, Upper Volga, Volga-Don, Volga-Kama, Trans-Volga, Lower Volga, Black Sea Region, Bessarabia, Upper Dniester; *Caucasus*: Ciscaucasia, Dagestan; *Western Siberia*: All regions; *Eastern Siberia*: Angara-Sayans? Dauria? Lena-Kolyma; *Soviet Central Asia*: Aralo-Caspian Region (north), Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan, Syr-Darya. *General distribution*: Scandinavia (southern), Atlantic Europe, Central Europe, Balkans-Asia Minor (north), Mongolia. Described from Western Europe. Type in London.

2. *S. grandidentatus* Ldb. Fl. Ross. II (1844–1846) 636; Grossh. Fl. Kavk. IV, 154.—*S. arenarius* MB. in Bess. Cat. Hort. Crem. (1816) 129, non Thunb. Prodr. pl. Capens (1800) 158.—*S. erucifolius* α. *canescens* Trautv. in Mélang. biol. II (1858) 130.—? *S. jacobaea* L. *farinosus* Lindem. Fl. Elisabethgr. (1867) 183; Prodr. Fl. chersonens. 113.—*S. erucifolius* β. *latifolius* and γ. *grandidentatus* Boiss. Fl. or. III (1875) 392.—*S. erucifolius* var. *mollis* Trautv. in Tr. Peterb. Bot. Sada, X (1877) 117.—*S. ponticus* Grecescu. Suppl. Fl. Romanei (1904) 199.—*S. mollis* auct. Fl. cauc. non Willd.: Grossh. Fl. Kavk. IV, 154.—**Exs.**: GRF No. 1779; Pl. orient. exs. No. 247.



Perennial. Rhizome short; stem simple, erect, finely ribbed, floccose-arachnoid-hairy, 30–100 cm high. Basal and lower cauline leaves withering early, middle cauline leaves ovate, deeply lobed or coarsely toothed with acute lobes and teeth, weakly arachnoid-hairy-floccose above, more densely hairy and grayish beneath, with small auricles, 5–10 cm long and 2.5–4.5 cm wide; upper leaves smaller, deeply divided. Capitula numerous, in corymbose inflorescence. Involucre 5 mm long and almost as much in dia; inner involucre bracts ovate-lanceolate, with wide, white border, acute or acuminate, weakly pubescent on outer side; outer bracts 8–10, linear, up to a half as long as inner bracts. Ligulate florets yellow, 10–15. Achenes pubescent, 2 mm long. Flowering June to September; fruiting October (Plate XXXIII, Fig. 1).

Scrubs, forest edges, river valleys, sandy steppes, wet, sometimes alkaline meadows, mountains up to 1,500 m.—*European part*: Trans-Volga, Volga-Don, Volga-Kama, Bessarabia, Lower Volga, Lower Don, Black Sea Region, Crimea; Caucasus: Ciscaucasia, Dagestan, Eastern and Southern Transcaucasia, Talysh; *Western Siberia*: Upper Tobol; *Soviet Central Asia*: Aralo-Caspian Region (Mugodzhary, Chelkar, Irgiz, and others). *General distribution*: Armenia and Kurdistan, Balkans (Romania). Described from Sar Island near Baku. Type in Leningrad.

Note. D.I. Litwinow (op. cit.) considered the name *S. arenarius* MB. to have priority for this species. But, apparently, he did not know that, in the genus *Senecio* the epithet *arenarius* is a homonym of *S. arenarius* Thunb. (1800) from southern Africa, described earlier by Thunberg.

3. *S. korshinskyi* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 3 (1937) 352.

Perennial. Whole plant more or less floccose-woolly or subglabrous. Stem erect, finely ribbed, sometimes violet below, 30–60 cm high. Basal and lower cauline leaves oblong, oblong-obovate, or elliptical, 8–20 cm long and 1–5 cm wide, undivided or almost lyrate, more or less deeply sinuate-toothed, with acuminate teeth, narrowed into rather long, thickish, basally expanded and serrately winged-petiole; middle and upper cauline leaves identical to basal leaves, sessile, at base expanded, with irregularly lobed-toothed auricles; uppermost leaves linear. Capitula on more or less long peduncle. Involucre about 1.0 mm in dia; outer involucre bracts 2–3, linear, a half as long as inner, latter lanceolate-linear, 4–5 mm long, blackish-brown in upper half, glabrous or pubescent, with narrow yellowish-green border. Ligulate florets 10, yellow, linear, 8 mm long. Achenes 4 mm long, very slightly curved, indistinctly ribbed, glabrous, brownish; pappus 7–8 mm long. Flowering July to August.

Mountain slopes at 2,000–3,600 m.—*Soviet Central Asia*: Pamiro-Alai Region. *General distribution*: Afghanistan, Indian Himalayas (Kashmir). Described from Pyandzh River. Type in Leningrad.

- 715 4. ***S. jacobaea*** L. Sp. pl. (1753) 870; Ldb. Fl. Ross. II, 635; Boiss. Fl. or. III, 392; Schmalh. Fl. II, 87, ex p.; Grossh. Fl. Kavk. IV, 154; Kryl. Fl. Zap. Sib. XI, 2845.—*S. jacobaea* var. *typica* Trautv. in Mélang. biol. II (1854) 130.—*S. erucaefolius* Ldb. Fl. Alt. IV (1830) 110, non L.—*Jacobaea vulgaris* Gaertn. De fruct. et semin. II (1791) 445.—*J. sicca* Gilib. Fl. lithuan. III (1782) 149.— *Ic.*: Rchb. Ic. Fl. Germ. XVI, t. 964 (1853); Fedtsch. and Fler. Fl. Evrop. Ross. 993.— *Exs.*: Fl. Polon. exs. No. 350; Pl. Finl. exs. No. 984; Eston. plants No. 136.

Perennial. Rhizome branched; whole plant arachnoid-hairy or subglabrous; stem erect, sulcate, simple or branched from middle, 20–100 cm high. Basal leaves clustered in rosette, withering before anthesis; lower cauline leaves with more or less long petiole, oblong-obovate, obtusely toothed or lyrate incised, with ovate terminal lobe, 2–10 cm long and 2–8 cm wide; middle cauline leaves sessile, lyrate pinnate, with linear or lanceolate, apically broadened and incised lobes, 2–8 cm long and 1–3 cm wide; upper leaves pinnately cut, their lobes 2–10 mm wide, oblong, subobtusely, irregularly toothed or pinnately divided. Capitula usually numerous, aggregated into corymbose panicle. Involucre (5)8–10 mm in dia; outer involucral bracts 2–6, a third to a half as long as broadly lanceolate inner bracts. Ligulate florets yellow, 12–15, as long as involucre, 2.5–4.0 mm wide. Achenes oblong-terete, 2–3 mm long, peripheral achenes glabrous, with pappus of few fragile hairs; inner achenes pubescent, with well-developed persistent pappus. Flowering June to August.

Thin forests, often in oak, birch, and linden forests and along their edges, scrubs, meadow-steppes, sometimes on calcareous soils, often as weed of roadsides and railroads.—*European part*: Dvina-Pechora (introduced), Ladoga-Ilmen, Baltic Region, Upper Dnieper, Middle Dnieper, Upper Volga, Volga-Kama, Trans-Volga, Lower Don, Lower Volga, Black Sea Region, Bessarabia, Crimea, Upper Dniester *Caucasus*: Ciscaucasia, Eastern, Western, and Southern Transcaucasia; *Western Siberia*: All regions; *Eastern Siberia*: Angara-Sayans; *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Dzhungaria-Tarbagatai, Syr-Darya, Tien Shan, Pamiro-Alai Region (Alai Range). *General distribution*: Central Europe, Atlantic Europe, Scandinavia, Mongolia, North America (introduced). Described from meadows of western Europe. Type in London.

5. *S. ambraceus* Turcz. ex DC. Prodr. VI (1837) 348; Turcz. Fl. baic.-dahur. II, 89.—?*Cineraria ambracea* Hornem. Hort. Hafn. Suppl. (1819) 972.—*S. jacobaea* β . *grandiflorus* Turcz. ex. DC. Prodr. VI (1837) 350; Ldb. Fl. Ross. II.—*S. erucifolius* var. (*flor. majoribus*) Ldb. Fl. Alt. IV (1833) 110.—*S. krylovii* Schischk. in Fl. Zap. Sib. XI (1949) 2847.—*S. jacobaea* L. var. *ambracea* Trautv. and Mey. Florula ochot (1856) 56.

716 Perennial. Rhizome short, with numerous, rather long roots. Stem solitary, erect, branched above or sometimes from middle, with obliquely upright branches, cylindrical, often violet, finely arachnoid-hairy or subglabrous, 30–80 cm high. Basal leaves withering early, with petioles as long as or longer than lamina, lamina ovate and oblong, obtuse, irregularly toothed with obtuse teeth, at base sometimes pinnately divided, 5–8 cm long, 1–3 cm wide, glabrous on both sides; cauline leaves sessile, auriculate, pinnately cut, sometimes almost up to midrib, lobes linear-oblong, subobtuse, in turn pinnately divided or irregularly toothed; upper-most leaves small, linear, almost entire. Capitula on long, weakly arachnoid-hairy peduncles, 1.5–6.0 cm long. Involucre broadly campanulate, 5–6 mm long and about 10 mm in dia, glabrous, only at base weakly arachnoid-hairy; outer involucre bracts 2–6, linear, acuminate, up to a half as long as inner; inner bracts lanceolate or narrowly oblong, with scarious margin. Ligulate florets yellow, 18–20. Achenes 2 mm long, terete, white-pubescent; pappus white, as long as tubular florets. Flowering July to August.

Wet meadows, birch-aspen forests, sometimes on gravel beds of rivers.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, Dauria, Lena-Kolyma; *Far East*: Zeya-Bureya. *General distribution*: Mongolia, northeastern China. Described from route between Okhotsk and Yakutsk. Type in Geneva; cotype in Leningrad.

Note. Horneman (loc. cit.) described under the name *Cineraria ambraceus* a plant grown from seeds obtained from the Goren Botanical Garden, but the origin of the plant has remained unknown. It is not possible to establish if it is identical to *Senecio ambraceus* Turcz. on the basis of the short description. Ledebour (loc. cit.) supposed that *Cineraria ambracea* Horn. is close and, perhaps, identical to *Senecio lyratifolius* Rchb. Some authors have noted that the specific epithet *ambraceus* cannot be used for the Siberian plant because the latter does not have the resinous odor.

6. *S. argunensis* Turcz. in Bull. Soc. Nat. Mosc. XX (1847) 18.—*S. jacobaea grandiflorus* Turcz. in DC. Prodr. VI (1837) 350 p.—*S. praealtus davuricus* DC. Prodr. VI (1837) 351.—*S. argunensis* f. *angustifolius* and f. *latifolius* Kom. Fl. Manchzh. III (1907) 706.—*S.*

blinii Leveille in Fedde, Repert. VIII (1910) 138.—**lc.**: Kom. and Alis. Opređ. Rast. Dalnevost. Kr. II, Plate 314; Sato, Willd. Fl. Manch. and Mong. (1927) tab. 16.

Perennial. Rhizome creeping, 3–7 mm thick, short, scatteredly covered with slender roots. Stem solitary, erect, 25–60(90) cm high, together with leaves weakly arachnoid-hairy, sometimes subglabrous, branched in inflorescence. Basal and lower cauline leaves withering early; middle cauline leaves sessile, numerous, their laminas ovate, 6–15 cm long and 2–5 cm wide, pinnately divided, sometimes almost up to midrib, into linear or narrowly lanceolate, 1–2 cm long and 1–5 mm wide lobes, terminal lobe often larger than rest. Capitula 5–20 (less often 2–3), aggregated into corymbose inflorescence, peduncles white-arachnoid-hairy below capitulum. Involucre broadly campanulate, 5 mm long and 6–7 mm in dia; outer involucre bracts linear, about 10, considerably shorter than inner; inner bracts lanceolate, acuminate with narrow scarious margin, weakly pubescent or subglabrous. Ligulate florets yellow, 10–15, about 10–15 mm long and 2–3 mm wide. Achenes glabrous, sulcate, oblong, 2.0–2.5 mm long. Flowering August to September.

Scrubs, forest edges, in reedy and other meadows.—*Eastern Siberia*: Dauria; *Far East*: ?Zeya-Bureya, Ussuri. *General distribution*: Mongolia, northeastern China. Described from Urulungui Creek and Argun River. Type in Leningrad.

7. **S. saposhnikovii** Krasch. and Schipcz. in Fedde. Repert. XXVI (1924) 113.—*A. doriaeformis* auct. nonnul. fl. As med. non DC.

Perennial. Stem 40–50 cm high, erect, glabrous or sometimes weakly arachnoid-hairy, sulcate, often branched. Leaves thick, lower and middle ones lanceolate, 7–10 cm long and 1.5–2.5 cm wide, more or less irregularly cristate-toothed, sometimes pinnatifid, basally narrowed into petiole, subobtuse or acuminate; upper leaves entire or with small teeth, linear-lanceolate. Inflorescence corymbose. Involucre obconical-cylindrical, 5–6 mm long and about 3 mm in dia, on weakly arachnoid-hairy peduncles and with few, narrowly linear, bracteal leaves; outer involucre bracts 1–2, linear, a half as long as inner bracts or almost as long; inner bracts broadly linear, obtuse or subacute, with broadly scarious and ciliate margin. Ligulate florets 5, slightly longer than involucre, yellow. Achenes terete, 3 mm long, glabrous; pappus 6–7 mm long, white, at base stramineous-yellow. Flowering August.

Turfy and stony slopes, talus, gravel beds and in subalpine meadows at 2,000–2,500 m.—*Soviet Central Asia*: Tien Shan, Syr-Darya. Described from Tien Shan. Type in Leningrad.

8. **S. erraticus** Bertol. Rar. Ital. pl. dec. III (1810) 62; Amoen. Ital. 92 and Fl. Ital. IX, 237; DC. Prodr. VI, 349; Ldb. Fl. Ross. II, 634; C. Koch in Linnaea, XVII, 47; Boiss. Fl. or. III, 392; Grossh. Fl. Kavk. IV, 155; M. Popov, Ocherki Rast. i Fl. Karpat. 246.—*S. barbareae folius* Krock. Fl. Siles. II, 2 (1790) 421.—*S. aquaticus* Huds. *barbareifolius* Wimm. and Grab. Fl. Siles. II, 2 (1829) 151.—*S. erraticus* (Bertol.) Hegi, Ill. Fl. IV, 2 (1928) 777.—*S. erraticus* Bertol. subsp. *barbareifolius* (Wimm. and Gr.) Hegi, op. cit. p. 776.—*S. jacobaea* var. *erraticus* Fiori and Paol. Icon. Fl. Ital. (1903) 412.—
 718 **1c.**: Fior. and Paol. (1903) op. cit.—**Exs.**: Fl. Ital. exs. No. 1369 and 1369 bis; Fl. exs. Reipubl. Bogem.-Sloven. No. 957; Fl. exs. Austro-Hung. No. 1808.

Root vertical, with several, more or less thick, lateral roots. Stem solitary, erect, branched from middle, with long, glabrous or weakly arachnoid-hairy branches, 20–70 cm high. Basal and lower cauline leaves with petioles almost as long as lamina, latter glabrous, lyrate lobed, 5–18 cm long and 2–5 cm wide, terminal lobe ovate, sometimes with cordate base, with irregular acuminate teeth; middle cauline leaves pinnately cut, sessile, with semiamplexicaul lobed auricles; uppermost leaves oblong-linear, small, with few teeth or almost entire. Capitula numerous at apices of stem and branches, in broadly corymbose panicle; peduncles as long as involucre or several times as long, glabrous or weakly hairy. Involucre glabrous, broadly campanulate, about 5 mm long and 8 mm in dia; outer involucral bracts linear, 2–6, a third to a half as long as inner; inner bracts oblong-rhombic, with narrow scarious margin. Ligulate florets 8–12, yellow, 4–5 mm long and about 2 mm wide. Pappus caducous; peripheral achenes subglabrous, inner ones (of tubular florets) more or less pubescent. Flowering July to August.

Forest edges, in scrubs on marshy meadows, gravel beds, and roadsides.—*European part*: Baltic Region (Kaliningrad), Upper Dniester (mainly in Trans-Carpathian Mountains); *Caucasus*: Western Transcaucasia. *General distribution*: Central Europe, western Mediterranean Region, Atlantic Europe, Balkans-Asia Minor. Described from Italy. Type in Bologna.

Note. In the Herbarium of the V.L. Komarov Botanical Institute of the Academy of Sciences of the USSR, there is one specimen of this species from Zheleznovodsk (Northern Caucasus) from the herbarium of I.Ya. Akinfiev the famous researcher of the Caucasus. Apparently the label on this specimen is erroneous because other material of this species from the Northern Caucasus could not be found. In Transcaucasia, *S. erraticus* Bertol. is known from Western Transcaucasia, where it is a common plant. There are certain grounds to suppose that in Western Transcaucasia this plant was introduced from the Western Mediterranean region, where suitable conditions for its survival are found.

Series 2. Borysthenici Schischk.—Leaves twice or thrice pinnately incised, with narrowly linear terminal lobe; plants weakly pubescent.

9. **S. borysthenicus** Andr. ex DC. Prodr. VI (1837) 351, nom. in syn.—*S. praealtus borysthenicus* DC. ibid. (1837); Ldb. Fl. Ross. II, 634.—*S. jacobaea* var. *borysthenica* Trautv. in Mélang. biol. II (1854) 131 and in Bull. de la classe phys.-meth. AC. Sc. de Saint Pétersb. XII (1854) 351; Schmalh. Fl. II, 87.—**Exs.:** GRF No. 3494.

719 Perennial. Rhizome vertical or ascending, short. Stems few, erect, weakly flexuous, finely sulcate, branched from middle or only at apex; branches upright, arachnoid-hairy, sometimes subglabrous, usually violet below, 30–90 cm high. Basal and lower cauline leaves withering early, long-petiolate, petioles as long as lamina, lamina oblong, 5–10 cm long and 2–4 cm wide, twice or thrice pinnately incised, with linear, 5–10 mm long and 0.5–1.0(3.0) mm wide lobes; middle cauline leaves like basal leaves, but smaller, short petiolate, upper leaves sessile; all leaves arachnoid-hairy or sometimes subglabrous. Capitula numerous, at apices of stem and branches, forming paniculate or more or less lax corymbose inflorescence on 1–4 cm long peduncles, with small bracteal leaves. Involucre campanulate, 5–7 mm long and almost as much in dia in upper part; outer bracts 1–5, linear, acuminate, a half as long as inner ones; inner bracts oblong, greenish, whitish along margin, with darker stripe on dorsal side. Ligulate florets 10–15, oblong-linear, almost twice as long as involucre. Achenes terete, ribbed, peripheral achenes glabrous, lacking pappus, inner achenes finely pubescent, with about 2.5 mm-long rudimentary pappus. Flowering June to August; fruiting September.

River sands, sandy steppes and sandy pine woodlands.—*European part:* Upper Dnieper, Middle Dnieper, Volga-Don, Black Sea Region, Lower Don, Crimea (north), Bessarabia, Upper Dniester. Endemic. Described from Podolia and Kherson. Type in Geneva.

Note. Christian von Steven also noted this plant. He collected it from the shifting sands between Perekop and Alyoshka and near Kerch, where it is found in abundance. Steven referred it to *S. erucifolius* L., but with the comment that it strongly differs from var. *genuinus* and deserves to be treated as a separate species (which was already done earlier by Andrzejowski).

10. **S. schischkinianus** Sof. in Izv. Akad. Nauk. Azerb. SSR, No. 1 (1957) 83.—*S. erucifolius* auct. Fl. cauc. non L.: Schmalh. Fl. II, 87, p. p.; Lipsky, Fl. Kavk., 351; Grossh. Fl. Kavk. IV, 554.—*S. erucifolius latilobus* Boiss. Fl. or. III (1875) 392.—*S. borysthenicus* Grossh. Opred. Rast. Kavk. 470, non Andr.—**Ic.:** Sof. op. cit. p. 85.

Perennial. Root ascending, slender. Stem erect, simple or branched above, weakly sulcate, including leaves somewhat hairy or subglabrous, 40–70 cm high. Leaves twice pinnately incised, with linear or oblong, sessile lobes; basal leaves withering early; lower cauline leaves short-petiolate, obovate or oblong, 8–10 cm long and about 3 cm wide, their lobes narrowly oblong, with occasional teeth; middle cauline leaves smaller, sessile, amplexicaul, auriculate. Peduncles with small, 1–2 mm long, linear-subulate bracteal leaves. Capitula numerous, 20–30, 720 in corymbose-paniculate inflorescence. Involucre 6–8 mm long and almost as much in dia; outer involucre bracts 3–5, linear-subulate, a third as long as inner ones; inner bracts lanceolate or linear-lanceolate, 10–14, with scarious border, subglabrous. Ligulate florets yellow, 12–15, 8–10 mm long and 1.5–2.0 mm wide. Achenes terete, 3–4 mm long, densely hairy with stiff hairs; pappus white, 2–3 times as long as achenes. Flowering June to August; fruiting August to September.

Sands, particularly river sands, rarely on talus.—*Caucasus*: Ciscaucasia, Dagestan. Endemic. Described from Dagestan (Kumtorkali). Type in Leningrad.

10a. *S. ferganensis* Schischk. sp. nov. in Addenda, XXV, 881.

Perennial. Stem erect, branched above, with obliquely upright branches, including leaves arachnoid-floccose-pubescent, 60–75 cm high. Leaves twice pinnately incised; basal and lower cauline leaves withering early; cauline leaves numerous, narrowly ovate, sessile, at base somewhat expanded and with inconspicuous auricles, 6–15 cm long and 1.5–3.0 cm wide. Inflorescence corymbose, with upward spreading branches; capitula numerous, up to 15–30, broadly campanulate, 5 mm long and 10 mm in dia. Outer involucre bracts 3–5, linear, adpressed to inner bracts or somewhat squarrose, a third to two-thirds as long as inner; inner bracts narrowly ovate, subacute, weakly hairy or subglabrous. Ligulate florets yellow, twice as long as involucre. Achenes glabrous, about 2 mm long. Flowering June to July.

Gravel beds of rivers, banks of irrigation canals, slopes.—*Soviet Central Asia*: Syr-Darya, Pamiro-Alai Region (Alai Range). Described from Alai Range. Type in Leningrad.

Section 2. Incani DC. Prodr. VI (1937) 355.—*Velutini* Boiss. Fl. or III (1875) 384.—Perennials; leaves hairy, particularly below, variously pinnately lobed, with obtuse lobes, upper leaves often with auricles or amplexicaul; involucre in 2 whorls with very few outer involucre bracts; ligulate florets 5–12, yellow.

Series 1. Cinerariae Schischk.—Leaves twice pinnately incised, dark green above, with sparse floccose-arachnoid-hairs, densely white-tomentose beneath.

11. **S. cineraria** DC. Prodr. VI (1837) 355; Boiss. Fl. or. III, 395; Fedtsch. and Fler. Fl. Evrop. Ross. 993.—*S. maritimus* Rchb. Fl. Germ. exc. (1830–1832) 244, non L. fil. (1791).—*Cineraria meritima* L. Sp. pl. (1753) 925.—*Jacobaea tomentosa* Moench. Meth. (1794) 587.—**721** **Ic.**: Sibth. and Sm. Fl. Graec. IX, tab. 871; Hegi, Ill. Fl. VI, 2, 725, 729; Jav. and Csapody. Iconogr. Fl. Hung. (1933) 531; Rchb. Ic. Fl. Germ. XVI, tab. 968 (1853); Gartenfl. XXXI (1882) 276.

Perennial. At base somewhat woody. Stem ascending or erect, weakly flexuous, simple, usually branched only in inflorescence, less often from base, white-tomentose, 20–40 cm high, and 3–5 mm thick. Basal and lower cauline leaves long-persisting, ovate, twice pinnately incised, with terminal lobe oblong, obtuse, 5–10 mm long and 2–5 mm wide, dark green above, with sparse floccose-arachnoid hairs, densely white-tomentose beneath, petiolate, petiole shorter than lamina; cauline leaves like basal, gradually reducing upward and less divided (simple pinnate). Capitula numerous, in corymbose inflorescence, on white-arachnoid-hairy peduncles. Involucre 5 mm long and 6 mm in dia; inner involucre bracts linear-lanceolate, acuminate, on dorsal side white-arachnoid-hairy; outer bracts 5, narrowly linear, much shorter than inner ones. Ligulate florets yellow, about 8, twice as long as involucre. Achenes glabrous, 1.5 mm long; pappus brownish. Flowering June to July; fruiting August to September.

Coastal rocks. In USSR, as introduced plant that escaped cultivation, found growing wild in places.—*European part*: Crimea (southern coast). *General distribution*: Western Mediterranean Region, in the east as far as Greece. Described from Mediterranean coast. Type in Geneva.

12. **S. lorentii** Hochst. in Flora, XXVIII (1845) 27, non Griseb. (1874).—*S. gundelius* C. Koch in Linnaea, XXIV (1851) 364.—*S. armenius* Jaub. and Sp. Ill. pl. or. IV (1850–1853) 143; Boiss. Fl. or. III, 397; Grossh. Fl. Kavk. IV, 162.—*S. pedunculatus* Trautv. in Tr. Bot. Sada, III (1875) 277.— **Ic.**: Jaub. and Sp. op. cit. tab. 398.— **Exs.**: Fl. cauc. exs. No. 221.

Perennial. Rhizome ascending, about 0.8 cm thick. Stem erect, somewhat flexuous, striate, leafy up to middle or slightly above, apically more or less branched, densely floccose-white-tomentose, 15–65 cm high. Basal and lower cauline leaves with expanded petioles almost as long as lamina, lamina oblong, 6–12 cm long and 2.5–7.0 cm wide,

pinnately incised, with 3–5 ovate, obtuse, entire or weakly divided lobes, terminal lobe broadly deltoid, larger; middle cauline leaves (if present) similar to basal, smaller, sessile; upper leaves small, linear-lanceolate, toothed or entire, auriculate, all leaves, particularly beneath, densely arachnoid-hairy. Inflorescence lax corymbose. Capitula 2–10, on short or long, white-tomentose peduncles. Involucre white-tomentose, broadly campanulate, 8–10 mm long and 12–15 mm in dia; outer involucral bracts 1–3, linear or setaceous, a half as long as inner ones; 722 inner bracts linear, dorsally keeled. Ligulate florets yellow, 10–15, 15 mm long and 4.5 mm wide, glabrous. Flowering July to August.

Crevices of rocks, stony slopes.—*Caucasus*: Western Transcaucasia (gorge of Chorokh River). *General distribution*: Armenia and Kurdistan. Described from vicinity of Erzerum. Type was in Berlin.

13. *S. lipskyi* Lom. in Tr. Tifl. Bot. Sada, III (1899) 51; Grossh. Fl. Kavk. IV, 151.—*S. saxatilis* Lom. in Tr. Tifl. Bot. Sada, II (1897) 28 non Wall. (1828) No. 3131, nom. nud., descr. apud DC. Prodr. VI (1837) 367.—*Exs.*: Pl. or. exs. No. 246.

Perennial. Rhizome ascending or horizontal, 0.6–0.8 cm thick, covered with long and slender roots. Stem usually solitary, erect, white-tomentose at base, floccose-arachnoid-hairy and branched above, 40–75 cm high. Basal leaves numerous, dark green and arachnoid-hairy above, white-tomentose beneath, with petiole as long as, shorter or longer than lamina, lamina ovate or oblong-ovate, 5–9 cm long, 3–6 cm wide, lyrate, with 2–4 pairs of lobes, terminal lobe deltoid, larger than others, basally truncate or weakly cordate, lateral lobes gradually reduced downward, usually remote, all lobes with coarse, unequal, obtuse teeth or lobate, with broad base, decurrent on petiole; cauline leaves fewer, lower and middle cauline leaves similar to basal but sessile, with semiamplexicaul auricles; upper leaves lanceolate or linear-lanceolate, divided or toothed, sometimes almost entire, small. Capitula 2–7, sometimes up to 25, forming corymbose inflorescence. Involucre 5–6 mm long, 12–15 mm in dia; outer involucral bracts 2–7, linear, a third to a half as long as inner ones; inner bracts oblong, acute, with scarious margin. Ligulate florets egg-yellow, about 10, 10–12 mm long and 2–5 mm wide. Achenes terete, 4–5 mm long, ribbed, white-pubescent along ribs, later subglabrous(?). Flowering June to July; fruiting August.

Mountain-steppe and subalpine, often calcareous, slopes on talus, at 1,600–2,400 m.—*Caucasus*: Southern Transcaucasia. *General distribution*: Northern Iran. Described from Takali Mountains near the village of Bechenakh. Type in Leningrad.

14. *S. massagetovii* Schischk. sp. nov. in Addenda, XXV (1960) 882.—*S. pedunculatus* Trautv. in sched. ad Herb. Inst. bot. nom. Komarovii, Ac. Sc. URSS non Trautv. in Tr. Bot. Sada, III, 2 (1875) 277.—Exs.: Herb. Fl. cauc. curante. Woronow, No. 98.

723 Perennial. Rhizome rather thick, 0.5 cm thick, with few long roots. Stem solitary, floccose-arachnoid-hairy, sulcate, more or less branched above, 50–75 cm high. Basal and lower cauline leaves with expanded petioles as long as lamina or longer; lamina ovate-oblong, 6–20 cm long and 3–10 cm wide, dark green and subglabrous above, densely arachnoid-hairy beneath, lyrate, pinnate, with 2–3 somewhat remote lobes reduced downward, unequally toothed, terminal lobe considerably larger than others; middle cauline leaves similar to basal but sessile, with semiamplexicaul auricles. Capitula numerous (10–40), forming lax, corymbose paniculate inflorescence, peduncles as long or many times exceeding capitula. Involucre floccose-arachnoid-hairy, 6 mm long and 10 mm in dia; outer involucre bracts narrowly linear, 1–5, a half as long as inner (sometimes absent); inner bracts oblong-linear, dorsally keeled. Ligulate florets yellow, 13–15, about 10 mm long and 2–3 mm wide. Achenes terete, glabrous, weakly ribbed, 4.0–4.5 mm long. Flowering June.

Stony slopes.—*Caucasus*: Eastern Transcaucasia. Endemic. Described from vicinity of Borzhomi (Sakochavi). Type in Leningrad.

Note. Trautvetter identified the plant from Borzhomi as *S. pedunculatus* Trautv. But this plant, described by him from the vicinity of Erzerum, is identical to *S. armenius* Jaub. and Sp. The plant from Eastern Transcaucasia differs from the Erzerum plant by smaller and more numerous (10–40 and not 2–10) capitula, the uniform leafiness of the stem, and later flowering. The range of this species is not yet quite clear.

Series 2. Arnicoidei Schischk.—Stem hollow; leaves undivided, ovate, unevenly toothed, green above, densely arachnoid-hairy beneath, with suborbiculate auricles; outer involucre bracts 8, narrowly linear; achenes about 7 mm long, glabrous.

15. *S. pseudoarnica* Less. in Linnaea, VI (1831) 240; Ldb. Fl. Ross. II, 642; Kom. Fl. Manchzh. III, 704.—*Arnica maritima* L. Sp. pl. (1753) 884, non *Senecio maritimus* L. fil. (1781).—*S. pseudoarnica* var. *kurilensis* Kudo, Fl. Paramush. (1922) 171.

Perennial. Rhizome short, covered with numerous long roots. Stem erect, simple, hollow, glabrous below, about 1 cm thick, arachnoid-hairy above, often violet, 15–70 cm high. Basal and lower cauline leaves withering early, middle and upper leaves oblong, ovate, or

broadly ovate, undivided, 8–25 cm long and 2.5–9.0 cm wide, obtuse, unevenly toothed, green and glabrous above, much paler beneath and usually densely arachnoid-hairy, often whitish, cuneate toward base, narrow, sessile and with suborbicular, indistinctly toothed auricles. Capitula at apex of stem, 2–15, forming lax corymbose inflorescence, on arachnoid-hairy or subglabrous peduncles, peduncles short at beginning of anthesis, later elongated, with 1–4 cm long, narrowly linear bracteal leaves. Involucre broadly campanulate, almost
 724 hemispherical, 10–12 mm long and 20–25 mm in dia; outer involucre bracts about 8, narrowly linear, as long as inner bracts, weakly pubescent; inner bracts oblong, with broad scarious border, acuminate, more or less pubescent in outer side. Ligulate florets yellow, about 15, 15 mm long and 3–4 mm wide. Achenes glabrous, lustrous, light brown, sulcate, terete, 7 mm long and about 1 mm wide; pappus white. Flowering July to first half of September; fruiting September.

Coastal sands and gravel beds.—*Far East*: Ussuri, Uda River Area, Okhotsk, Kamchatka, Kuril Islands. *General distribution*: Beringia, North America, Japan. Described from Kamchatka. Type in Berlin.

16. **S. kubensis** Grossh. in Tr. Azerb. Otd. Zakavk. Fil. Akad. Nauk SSSR, Bot. 1 (1933) 59; Grossh. Fl. Kavk. IV, 159.

Perennial. Whole plant densely arachnoid-hairy. Stem 40–60 cm high, branched. Basal leaves withering before anthesis; cauline leaves with semiamplexicaul auricles, more or less long-petiolate, oblong, lyrate, pinnatisect, with 2 pairs of lateral, ovate, obtuse lobes and longer, shallow and obtusely sinuate-toothed terminal lobe; all lobes subglabrous above, white arachnoid-hairy beneath; upper leaves much smaller. Inflorescence corymbose, with many capitula; peduncles usually short. Involucre 10 mm long and 10–12 mm wide; outer involucre bracts linear, subobtusate, blackish, weakly pubescent. Ligulate florets bright yellow, 12. Achenes glabrous, 4–5 mm long. Flowering July.

Subalpine zone, crevices of rocks.—*Caucasus*: Eastern Transcaucasia. Endemic. Described from former Kuba District. Type in Baku; cotype in Leningrad.

17. **S. pandurifolius** C. Koch in Linnaea, XVII (1843) 48; Ldb. Fl. Ross. II, 644; Boiss. Fl. or. III, 399; Grossh. Fl. Kavk. IV, 153; Kolak. Fl. Abkh. IV, 249.—*S. conipes* Somm. and Lev. Nuov. Giorn. Bot. Ital. (1895) 88; Tr. Peterb. Bot. Sada, XVI, 239; Grossh. Fl. Kavk. IV, 153.—*Exs.*: Pl. cauc. exs. No. 50; Pl. or exs. No. 399.

Perennial. Whole plant white-arachnoid-hairy. Rhizome 5–10 mm thick, with numerous roots. Stems solitary or few, erect, somewhat branched above, floccose-pubescent, 20–50 cm high. Basal leaves with

petioles shorter than lamina, lamina broadly ovate, undivided, basally almost cordate, apically obtuse or panduriform, with large, terminal lobe cordate at base, and 2–3 pairs of small lobes, whitish beneath from dense arachnoid hairs, dark green above, with floccose pubescence, 2.5–12.0 cm long and 2–11 cm wide; cauline leaves 1–4, panduriform, sometimes almost undivided, usually sessile, with semiamplexicaul auricles. Capitula 2–6, on long peduncles several times as long as capitula. Involucre about 10 mm long and 12–15 mm in dia; outer involucre bracts linear, 1–7, a fourth to a half as long as inner ones; inner bracts linear-oblong, acuminate, densely arachnoid-hairy, later subglabrous. Ligulate florets yellow, 12, about 10 mm long and 4 mm wide. Achenes glabrous, terete, 4.0–4.5 mm long; pappus slightly shorter than tubular florets. Flowering May; fruiting June.

Calcareous rocks.—*Caucasus*: Ciscaucasia (Teberda), Western Transcaucasia. *General distribution*: Northern Turkey (Artvin). Described from Megrelin. Type in Berlin.

Section 3. Quadridentati Boiss. Fl. or. III (1875) 385.—Whole plant pubescent; leaves lyrate pinnatifid, with 2–5 pairs of sharp-toothed lobes; tubular florets with 4 teeth.

18. *S. taraxacifolius* (MB.) DC. Prodr. VI (1837) 348; Ldb. Fl. Ross. II, 633; Boiss. Fl. or. III, 413; Grossh. Fl. Kavk. IV, 153.—*Cineraria taraxacifolia* MB. Fl. taur.-cauc. II (1808) 313.—*Ligularia aucheri* DC. Prodr. VII (1838) 300.

Perennial. Whole plant covered with short glands, pale green, very rarely indistinctly pubescent. Rhizome ascending, 0.5–0.8 cm thick, with numerous, long, slender roots. Stems solitary or 2–3, at base covered with dark brown remnants of old petioles, branched in inflorescence, erect, sulcate, 10–50 cm high. Basal (withering early) and lower cauline leaves on more or less long, winged petioles, expanded at base, semiamplexicaul, their laminae ovate, lyrate divided with 2–5 pairs of deltoid or broadly ovate, sharp-toothed lobes, terminal lobe larger, ovate or cordate; upper leaves sessile or subsessile, smaller, usually auriculate, pinnately divided, uppermost leaves linear-lanceolate or linear, long-acuminate, sharp-toothed. Capitula 3–12, more or less long-pedunculate, forming lax corymbose panicle. Involucre about 10 mm long and 15 mm in dia; outer involucre bracts setaceous, shorter than involucre, 1–3 or absent; inner bracts lanceolate, acuminate, flat and densely glandular-pubescent on dorsal side. Ligulate florets 10–12, yellow, 15 mm long and 1.5–3.0 mm wide; tubular florets with 4 teeth. Achenes glabrous, terete, 4–5 mm long; pappus brownish, as long as tubular florets. Flowering July to August. (Plate XXXIV, Fig. 2).

726 Rocks in alpine zone, edges of glaciers, moraines, near melting snow at 2,400–3,100 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern, Western, and Southern Transcaucasia. *General distribution*: Armenia and Kurdistan, Asia Minor (Pontic Range), Iran (north). Described from Georgia. Type in Leningrad.

Note. Boissier segregated this species in a special “section,” *Quadridentati*, mentioning that *S. taraxacifolius* (MB.) DC. differs from all other groundsels. But Boissier reported this very character for *S. stenocephalus* Boiss. (= *S. pojarkovae* Schischk.), in which the tubular florets also are four-toothed.

Section 4. *Crociserides* DC. Prodr. VI (1837) 384.—Plants perennial; leaves undivided, entire or toothed, less often lobate or runcinate, basal leaves narrowed into long petiole; involucre 2-rowed, less often many bracts in outer whorl.

Series 1. *Subalpini* Schischk.—Involucre 8 mm long and 10–15 mm in dia, usually with 8–10 bracts; ligulate florets 10–12(15), yellow; achenes about 4.5 mm long. High mountain plants growing mainly in subalpine zone.

19. *S. subalpinus* C. Koch in Flora, XVII (1834) 614, in textu.—*S. cordifolius* auct. Carp. non Clairv.

Perennial. Rhizome horizontal, apically ascending, about 5 mm thick. Stem solitary, sulcate, erect, branched in inflorescence, arachnoid-hairy when young, later subglabrous, 40–80 cm high. Basal and lower cauline leaves with petioles longer than lamina, lamina broadly ovate, less often almost round, acute, or obtuse, sometimes roundish at apex, usually cordate at base, unevenly toothed with coarse teeth, glabrous, 2.5–6.0 cm long and 2.5–5.5 cm wide; middle cauline leaves on short, often expanded petiole, auriculate; upper leaves linear-oblong or linear, entire. Capitula 2–11, forming lax, corymbose inflorescence. Involucre broadly campanulate, 8 mm long and 12–15 mm in dia; involucre bracts linear-oblong, with narrow scarious margin, green or dark violet, dorsally arachnoid-hairy or subglabrous. Ligulate florets about 12, yellow or slightly orange, 10 mm long and 2.0–2.5 mm wide. Achenes ovate, glabrous; about 2 mm long; pappus brownish. Flowering July to August.

Mountain zone, at 1,600–1,700 m, mainly in alder stands.—*European part*: Upper Dniester (Goverla Mountain, Pope Ivan, Petros, Chorna Gora [Black Mountain] and other mountains). Endemic. Described from Carpathians. Type was in Berlin.

20. **S. buschianus** Sosn. in Zhurn. Russk. Bot. Obshch. XIV (1929) 84; Grossh. Fl. Kavk. IV, 150.

727 Perennial. Rhizome short, with numerous roots. Base of stem covered with thin, brownish, fibrous remnants of dead leaves. Stem erect, sulcate, solid, branched in inflorescence, usually densely arachnoid-hairy, 40–60 cm high. Basal leaves with petioles as long as, shorter or longer than lamina, their laminae ovate or lanceolate, obtuse or somewhat acute, unevenly toothed with short, acute, deltoid teeth, abruptly or gradually narrowed at base into petiole, 6–18 cm long and 3–6 cm wide, on both sides covered with semiappressed entangled hairs, particularly on veins; middle cauline leaves like basal but sessile, semiamplexicaul; upper leaves smaller, lanceolate or almost linear, weakly toothed, sometimes almost entire. Inflorescence indistinctly corymbose; capitula 3–12, on long, arachnoid-hairy peduncles with few small bracteal leaves. Involucre about 12 mm long and 15 mm in dia; outer involucre bracts 8–10, linear or lanceolate, half as long as or very slightly shorter than inner ones; inner bracts lanceolate, acuminate, along margin whitish, more or less densely arachnoid-hairy. Ligulate florets about 15, yellow, oblong, 2 cm long and 3–5 mm wide. Young achenes ribbed, glabrous; pappus white, shorter than tubular florets. Flowering July to August.

Subalpine meadows at 2,100–2,400 m.—*Caucasus*: Ciscaucasia (Balkaria). Endemic. Described from Balkaria. Type in Leningrad.

21. **S. pseudoorientalis** Schischk. nom. nov.—*S. orientalis* Willd. Sp. pl. III (1800) 2006, non Mill. Gard. Dict. ed. VIII (1768) No. 10; Ldb. Fl. Ross. II, 642; Boiss. Fl. or. III, 406, ex p.; Grossh. Fl. Kavk. IV, 150.

Perennial. Rhizome horizontal, with numerous, thick and long fibrous roots; tip of rhizome floccose-woolly. Stem solitary, glabrous, sulcate, erect, uniformly hairy, simple, only in inflorescence more or less branched, 20–60 cm high. Basal leaves withering early, glabrous or weakly pubescent beneath, oblong or oblong-lanceolate, gradually narrowed into long petiole, including petiole 10–25 cm long and 1.5–3.0 cm wide, acute or acuminate, finely toothed or almost entire; middle leaves short-petiolate, short-pubescent beneath; upper leaves sessile, lanceolate or linear, indistinctly toothed or entire, usually adpressed to stem. Capitula at stem apices, 1–5 or numerous and then forming lax corymbose or paniculate-racemose inflorescence. Involucre semiglobose, about 10 mm long and 15 mm in dia, outer involucre bracts about 10, linear, acuminate, usually weakly floccose, a third to a half as long as inner bracts, less often almost as long; inner bracts lanceolate-linear, subglabrous, obtusely keeled on dorsal side, with scarious margin, acute

728 and with a black spot at apex. Ligulate florets 10–12, yellow, 15–25 mm long and 3–4 mm wide. Achenes terete, ribbed, glabrous or sometimes weakly pubescent, 3.0–4.5 mm long; pappus white, considerably longer than involucre. Flowering June to July; fruiting August.

Mountain-steppe slopes, in thin mountain forests, subalpine meadows, at 1,600–2,500 m.—*Caucasus*: Southern Transcaucasia, Talysh. *General distribution*: Armenia and Kurdistan, Balkans-Asia Minor. Described from Armenia. Type in Berlin.

22. *S. kolenatianus* C.A.M. in Beitr. Pfl. Russ. Reich. VI (1849) 34; Schischkin in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk. SSSR, XV, 409.—*S. amphibolus* C. Koch in Linnaea, XXIV (1851) 361; Boiss. Fl. or. III, 405; Grossh. Fl. Kavk. IV, 150.—*S. longiradiatus* Trautv. in Ind. sem. Horti Petrop. (1865) 37.

Perennial. Whole plant glabrous or weakly arachnoid-hairy; rhizome short, densely covered with thin roots. Stem solitary, usually erect, simple or somewhat branched, sulcate, uniformly leafy, 20–80 cm high. Basal and lower cauline leaves withering early, with petioles as long as lamina, their laminas elliptical or elliptical-lanceolate, short-ciliate along margin, with small, subacute, somewhat uneven teeth, obtuse or subacute, with prominent veins, 3–10 cm long and 2.5–5.0 cm wide; middle cauline leaves ovate-lanceolate or lanceolate, gradually narrowed into short petiole or almost linear, semiamplexicaul, acuminate with aristate tip. Inflorescence lax corymbose. Capitula 2–7(10) or solitary. Involucre 8 mm long and 10 mm in dia, outer involucre bracts 5–7, linear, almost as long as inner bracts, glabrous or arachnoid-hairy; inner bracts linear-oblong, acuminate; all involucre bracts with a black spot near apex. Ligulate florets yellow, about 10, twice as long as involucre, 2–3(4) mm wide. Achenes ribbed, weakly hairy or subglabrous, 4.0–4.5 mm long. Flowering July to August.

Subalpine zone in meadows, at 2,000–2,700 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern and Western Transcaucasia. Endemic. Described from Kazbek Mountain. Type in Leningrad.

Series 2. Seravschanici Schischk.—Leaves on more or less long petioles, often 1.5 times as long as lamina, lamina undivided or basally pinnately divided; involucre about 15 mm long and 10 mm in dia; outer involucre bracts usually numerous; ligulate florets 6–10; achenes terete, 6–8 mm long and about 1 mm wide, with short and appressed hairs or glabrous.

23. *S. olgae* Rgl. and Schmalh. in E. Regel. Putesh. v Turkestan, A.P. Fedtschenko in 18 (1881) 45.—*S. acrobatensis* Franch. in Ann.

729 Sc. Nat. 6 sér. Bot. XVI (1883) 312.—*S. serwschanicus* Winkl. in Tr. Bot. Sada, XIV (1895) 153.—**Exs.:** GRF No. 4198.

Perennial. Rhizome ascending, 0.7–1.0 cm thick. Stem solitary, finely floccose-hairy or subglabrous, simple, branched only in inflorescence, 30–80 cm high. Basal and lower cauline leaves with usually long petioles, 1.5 times as long as lamina, lamina undivided or pinnately divided at base, with remote, few, often solitary lobes, broadly or oblong-ovate, 10–15 cm long and 5–7 cm wide, on both sides covered with soft, curly, semiappressed hairs, particularly on veins, sometimes almost subglabrous above, acute or subobtuse, with uneven, broadly deltoid, subobtuse or acute teeth, middle cauline leaves like lower, but on short petiole, often sessile and amplexicaul; upper leaves sessile. Inflorescence at stem apex, corymbose, with 3–7 capitula on more or less long peduncles. Involucre about 15 mm long and 10 mm in dia; outer involucre bracts 4–5, sparsely pubescent, narrowly linear, more or less appressed to inner bracts; inner bracts narrowly oblong, pubescent with scarious-coriaceous margin. Ligulate florets 8–10, yellow, oblong, 1.5–2 times as long as involucre, 3–4 mm wide. Achenes terete, covered with short and compactly semiappressed hairs, 6–8 mm long, 1 mm wide. Flowering May to June; fruiting June to July.

Stony and grassy slopes near rocks in juniper zone. At 1,000–1,200 m.—*Soviet Central Asia*: Pamiro-Alai Region. Endemic. Described from Bastand Gorge. Type in Leningrad.

24. *S. franchetii* Winkl. in Tr. Peterb. Bot. Sada, XI (1889) 165.—*S. bucharicus* Winkl. op. cit. (1889) 335.

Perennial. Rhizome ascending. Stem solitary, simple, arachnoid-hairy, 50–80 cm high. Leaves lanceolate or ovate, arachnoid-hairy beneath, subglabrous above; basal and lower cauline leaves on long, broadened petioles as long as lamina, at base often auriculate; upper leaves strongly reduced; all leaves subacute, usually coarse teeth. Inflorescence corymbose; capitula 3–13. Involucre 15 mm long and almost as much in dia; outer involucre bracts 1–5, linear; inner bracts 18–20, lanceolate, keeled, dorsally pubescent, with scarious border. Ligulate florets 8, yellow. Achenes pubescent, terete, 6–8 mm long. Flowering April to May; fruiting June to July.

Pistachio forests and stony slopes, at 1,000–2,000 m.—*Soviet Central Asia*: Pamiro-Alai Region. Endemic. Described from Hissar. Type in Leningrad.

Note. A significant error crept into Winkler's original description of this species: the achenes are characterized as glabrous. On the basis of the available type specimen, it is not possible to decide if the achenes

730 are glabrous or pubescent, because mature achenes are absent. However,

new collections from the same localities, and moreover in the fruiting stage, show undoubtedly that an error had crept into the author's description. In this series of species, only *S. paulsenii* O. Hoffm. has glabrous achenes.

25. *S. paulsenii* O. Hoffm. ex Paulsen in Kjoeb. Vidensk. Meddel. (1903) 152.

Perennial. Plant glabrous or weakly floccose-hairy. Rhizome creeping. Stems few or numerous, at base densely covered with whitish or brownish remnants of petioles of dead leaves, simple, erect, whitish, more or less lustrous and sulcate, 20–70 cm high. Basal leaves with petioles as long or almost twice as long as lamina, their laminas elliptical or oblong, 5–10 cm long and 1.5–5.0 cm wide, basally long-narrowed, with large and unequal teeth or toward base sometimes sinuate-lobate or almost pinnatifid; cauline leaves like basal, but on much shorter petioles; upper leaves smaller and sessile. Capitula at stem apices, solitary or 2–4, on 3–6 cm-long peduncle, peduncles thickened below capitulum. Involucre 15 mm long and 15–20 mm in dia, at base weakly pubescent; outer involucral bracts numerous, linear, 6–8 mm long and about 1 mm wide, leafy, short-acuminate, apically scarious; inner bracts 20–25, linear-oblong, green, purple above and covered with thin hairs. Ligulate florets 12, lemon-yellow 2 cm long and about 6 mm wide; tubular florets slightly longer than involucre. Achenes terete, glabrous, lustrous, 6–7 mm long and about 0.7 mm wide, longitudinally ribbed. Flowering June; fruiting August to September.

Stony and rubbly slopes, on talus and rocks, at 3,000–4,100 m.—*Soviet Central Asia*: Pamiro-Alai Region, Tien Shan (west). Endemic. Described from Pamiro-Alai Region. Type in Stockholm.

Note. Initially, I and other taxonomists determined this species to be *S. acrobatensis* Franch. Thanks to the courtesy of the Herbarium of the Paris National Museum, I received an authentic specimen of *S. acrobatensis* for study. Although the achenes were still immature in the specimen sent to me, they appeared pubescent. According to Czerneva's oral communication, attempts to collect a topotype of *S. acrobatensis* Franch. from the Ak-Rabat Pass proved futile, as only *S. olgae* was found there.

Series 3. Macrophylli Schischk.—Inflorescence large, corymbose paniculate or racemose; lower leaves 15–40 cm long and 6–10(15) cm wide; ligulate florets 5, less often 8.

26. *S. macrophyllus* MB. Fl. taur.-cauc. II (1808) 308, III (1819) 571; Ldb. Fl. Ross. II, 639, ex p.; Boiss. Fl. or III, 406; Gross. Fl. Kavk. IV, 151.—*S. umbrosus* Bess. Enum. pl. Volh. (1822) 33, 108.—

- 731 *S. microphyllus* (errore typogr.) Spreng. Syst. veg. III (1826) 556.—*S. doria* auct. fl. cauc. C. Koch in Linnaea, XVII (1843) 48, non L.

Perennial. Rhizome short, horizontal, thick. Stem 0.7 cm thick, solid, sulcate, more or less arachnoid-hairy, sometimes subglabrous, 100–150 cm high. Basal and lower cauline leaves undivided, obovate-oblong, gradually narrowed into long winged petiole, along margin unevenly cristate-toothed, teeth broadly triangular, apically cartilaginous, including petiole 20–40 cm long and 6–10(15) cm wide, subglabrous above, pubescent beneath; upper leaves smaller, sessile, with semiamplexicaul base, sometimes almost entire; uppermost leaves lanceolate, acuminate. Capitula numerous, forming corymbose paniculate inflorescence. Involucre broadly-campanulate, 5 mm long and almost as much in dia, glabrous; outer involucre bracts linear subulate, 1–3, a third to a half as long as inner; inner bracts oblong-linear with scarious border, obtuse. Ligulate florets yellow, about 5, 8–10 mm long and about 2 mm wide. Achenes glabrous, narrowly ovate, 3 mm long and about 1 mm wide, finely ribbed, with narrow black striations between ribs; pappus white-brownish. Flowering August; fruiting September.

Slopes in middle mountain zone, in oak forests, near ditches and irrigation canals.—*Caucasus*: Ciscaucasia? Endemic. Described from Terek and Kuma rivers. Type in Leningrad.

27. *S. racemosus* (MB.) DC. Prodr. VI (1837) 358, ex p.; Ldb. Fl. Ross. II, 643; Boiss. Fl. or. III, 402.—*S. racemosus* L. *puberus* DC. op. cit. (1837).—*S. caspicus* Less. in Linnaea, IX (1834) 170.—*S. pseudoracemosus* Grossh. in Tr. Azerb. Otd. Zakavk. Fil. Akad. Nauk SSSR, Bot. 1 (1933) 60; Grossh. Fl. Kavk. IV, 149.—*Cineraria racemosa* MB. Tableau prov. sit. sur la côte occid. de la mer casp. (1798) 119; Fl. taur.-cauc. I, 314, III, 573.—*Cineraria caspica* Pers. syn. II (1807) 43.

Perennial. Rhizome short, thick, with long thin fibrous roots. Stem solitary, at base covered with brown fibrous remnants of dead leaves, finely sulcate, simple or somewhat branched in inflorescence, 15–70 cm high. Basal and lower cauline leaves with petioles shorter or longer than lamina, lamina oblong-lanceolate or narrowly ovate, usually acute, with sharp, irregular teeth along margin, stiff-hairy above, particularly on veins, more densely beneath, 4–18 cm long and 1.5–3.0(6.0) cm wide; upper leaves like basal but smaller, narrowly linear-lanceolate, sessile. Capitula 3–25, in racemose inflorescence. Involucre about 10 mm long and 15 mm in dia, more or less pubescent; outer involucre bracts oblong-linear, 6–12, a third to a half as long as inner ones; inner bracts oblong lanceolate, scarious along margin, flat on spine.

- 732 Ligulate florets yellow, 10–20 mm long and 3–5 mm wide, 8–10.

Achenes terete, oblong, ribbed, glabrous, weakly lustrous, 4 mm long; pappus brownish, almost as long as tubular florets. Flowering July to August. (Plate XXXIV, Fig. 1).

Rubble slopes in subalpine and alpine zones, at 2,600–3,600 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern Transcaucasia. Endemic. Described from alpine zone of Glavnyi [Main] Caucasian Range. Type in Leningrad.

Note. Marschall Bieberstein described two species under the name *Cineraria racemosa*: one from the mountains of the Caucasus “in alpestribus caucasi,” and the other from the region south of Saratov. Since the Caucasus was mentioned as the first locality, I retain the name *Senecio racemosus* (MB) DC. for the Caucasian Mountain plant.

28. **A. thyrsophorus** C. Koch in Linnaea, XXIV (1851) 362; Grossh. Fl. Kavk. IV, 149.—*S. cyri* C. Koch, ibid. 1851.—*S. schelkovnikovii* Grossh. in Tr. Azerb. Otd. Zakavk. Fil. Akad. Nauk SSSR, Bot. 1 (1933) 60; Grossh. Fl. Kavk. IV, 149.—*S. racemosus* var. *schelkovnikovii* Grossh. in Grossh. and Schischk. Plantae orient. I (1924) 44; Grossh. Fl. Kavk. IV, 149.—*S. racemosus* var. *araxina* Trautv. in Tr. Peterb. Bot. Sada, II (1873) 550.—*S. racemosus* var. *glabra* DC. Prodr. VI (1837) 358.—**Exs.**: Pl. or No. 173.

Perennial. Rhizome short, thick, with long fibrous roots. Stem solitary, basally covered with dark brown fibrous remnants of dead leaves and also of leaf petioles, finely sulcate, solid glabrous or weakly arachnoid-hairy, branched in inflorescence, 25–100 cm high. Basal and lower cauline leaves with petioles more or less longer than lamina and gradually expanded toward base; lamina lanceolate or narrowly ovate, 8–20 cm long and 2.0–5.5 cm wide, with sharp teeth, larger teeth at base, sometimes basally pinnatifid, subglabrous above, with stiff hairs beneath; upper leaves smaller, linear-lanceolate, sessile, with semiamplexicaul auricles. Capitula numerous, aggregated in corymbose or racemose panicle. Involucre about 10 mm long and 15 mm in dia; involucre bracts glabrous, white-ciliate, only apically and sometimes along margin; outer involucre bracts linear, 6–12, a third to a half as long as broadly lanceolate inner bracts. Ligulate florets 8–10, yellow, 8–20 mm long and 2–3(5) mm wide. Achenes angular-ribbed, glabrous, about 4.5 mm long; pappus brownish, almost as long as tubular florets. Flowering July to August.

Rubble and herb slopes.—*Caucasus*: Southern and Eastern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from Darichichag. Type was in Berlin; cotype in Leningrad.

Note. This species is very close to *S. racemosus* (MB) DC. but differs from it by having a taller, subglabrous stem, almost glabrous involucre bracts, shorter ligulate florets, and a paniculate inflorescence.

29. **S. paucifolius** Gmel. R. d. Russl. I (1770) 171.—*S. kirghisicus* DC. Prodr. VI (1837) 362; Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 371; Kryl. Fl. Zap. Sib. XI, 2852.—*Cineraria glabrata* Ldb. Icon. pl. Fl. Ross. I (1829) tab. 94, non Swartz (1806) nec *Senecio glabratus* Hook. and Arn. Bot. Beech Voy. (1841) 32.—*Cineraria auriculata* Ldb. Fl. Alt. IV (1833) 105, non *S. auriculatus* Desf. (1800).—*S. racemosus* Ldb. Fl. Ross. II, 643, ex p.; Schmalh. Fl. II, 88, p.—*Branicia insignis* Andrz. ex Trautv. in A.H.P. VIII (1883) 476; Rogov. Obozr. Semenno. i Vysshikh Spor. Rast. Kievsk. Uch. Okr. 302, nomen.—**Ис.**: Gmel. S.G. loc. cit. tab. 38, f. 2.

Perennial. Rhizome with numerous, rather thick root strands. Stem erect, solitary, branched in inflorescence, sulcate, whitish or slightly violet, glabrous or with occasional hairs, 35–90 cm high. Basal leaves numerous, ovate or lanceolate-ovate, narrowed into more or less long petiole, including petiole 9–25 cm long and 1.0–7.5 cm wide, unevenly toothed, obtuse, pubescent beneath; lower cauline leaves identical with basal leaves, upper leaves smaller, narrowly lanceolate or oblong, sessile, with semiamplexicaul base. Inflorescence racemose-paniculate or narrowly paniculate. Involucre 9 mm long and almost as much in dia in upper part; outer involucre bracts linear, 12–15, a third to a half as long as broadly linear inner bracts; all bracts weakly pubescent or subglabrous. Ligulate florets 8–12, yellow, 12–14 mm long and 3.0–3.5 mm wide. Achenes terete, about 5 mm long and 1 mm wide, ribbed, pubescent along ribs; pappus slightly longer than tubular florets. Flowering July to August; fruiting September.

Alkaline meadows, sheep's fescue steppes, occasionally on solonchaks [salt marshes].—*European part*: Volga-Don, Lower Don, Middle Dnieper, Black Sea Region, Upper Dniester (Podolia), Trans-Volga, Lower Volga, Bessarabia; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Soviet Central Asia*: Aralo-Caspian Region (north), Lake Balkhash Region (north). Endemic. Described from southern European part of USSR. Type unknown.

30. **S. schvetsovii** Korsh. Tent. Fl. Ross. or. (1898) 519; Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 370.—*S. doria* Ldb. Fl. Ross. II, 639, p. non L.—*S. auriculatus* Desf. (1800).—*S. racemosus* Ldb. Fl. Ross. II, 643, ex p.; var. *microcephala* Trautv. in Bull. phys.-math. Acad. Sc. Pétersb. XII (1854) 351 and var. *macrocephala* Trautv. op. cit. (1854) 352.—*S. doria* β . *biebersteinii* Lindem. in Bull. Soc. Nat. Mosc. XL (1867) 133; Elisabethgrad. 85; Prodr. Fl. Cherson. (1872) 113.—*S. biebersteinii* Grec. Suppl. Consp. Fl. Romane (1909) 91.—*S. doria* β . *macrophylla* Schmalh. Fl. II (1897) 88 ex p.—**Ис.**: Fl. Yugo-Vost. Evrop. Ch. SSSR, 691.

734 Perennial. Rhizome horizontally creeping or obliquely ascending, about 1 cm thick. Stem erect, simple, branched only in inflorescence, weakly arachnoid-hairy, sulcate, 60–100 cm high. Leaves glabrous, glaucescent-green; lower leaves ovate, acute, gradually narrowed into winged petiole, in basal leaves petiole almost as long as lamina or a half as long, with irregularly toothed, often involute margin, lamina 15–30 cm long and 4.5–8.5 cm wide; middle cauline leaves sessile, ovate-lanceolate or lanceolate, with round or somewhat cordate base, unevenly toothed or almost entire. Inflorescence corymbose-paniculate; capitula numerous, on 2–20 mm long peduncles, with 2–3 small linear bracteal leaves. Involucre broadly campanulate, 5–6 mm long and 4–6 mm in dia above; outer involucre bracts linear, a fourth to a third as long as inner ones; inner bracts oblong, apically attenuate into fimbriate-ciliate, sometimes deflexed appendage. Ligulate florets usually 5, 10 mm long and 4 mm wide. Achenes glabrous, ribbed, 3–4 mm long. Flowering July to August.

Meadows, chalk slopes, forest edges, scrubs occasionally in saline meadows and ravines.—*European part*: Middle Dnieper, Volga-Don, Trans-Volga, Volga-Kama, Lower Volga, Lower Don, Black Sea Region, Bessarabia, Upper Dniester; *Western Siberia*: Upper Tobol; *Soviet Central Asia*: Aralo-Caspian Region (north). *General distribution*: Balkans (Romania). Described from Bashkiria (Davlekanovo). Type in Leningrad.

31. **S. umbrosus** Waldst. and Kit. Descr. et Icon. pl. rar. Hung. III (1806) 232.—*S. doria umbrosus* Schmalh. Fl. II (1897) 89.— *Ic.*: Waldst. and Kit. op. cit. tab. 210; Hegi, Ill. Fl. VI, 2, 757; Jav. and Csapody, Iconogr. Fl. Hung. (1933) 532.— *Exs.*: Fl. Hung. exs. No. 987, I and II.

Perennial. Rhizome about 1 cm thick. Stem 5–7 mm thick, white-pubescent below, subglabrous above, erect, simple, branched only above (in inflorescence), 50 cm high. Basal and lower cauline leaves ovate, 25–30 cm long and about 10 cm wide, subacute, long-attenuate toward base, sessile, uniformly toothed, green above, paler beneath, on both sides glabrous (only sometimes with occasional hairs on midrib); middle leaves smaller, narrowly-ovate, 7–10 cm long and 2.0–3.5 cm wide, sessile, amplexicaul; upper leaves lanceolate, acute, 2–5 cm long and 0.5–1.0 cm wide. Inflorescence paniculate-corymbose, with numerous capitula. Involucre 12–13 mm long and 10 cm in dia; inner involucre bracts narrowly ovate, with very wide, scarious border, acute, glabrous; outer bracts linear, 4–5. Ligulate florets eight, yellow-orange. Achenes glabrous. Flowering August.

Forest edges in river valleys.—*European part*: Upper Dniester. *General distribution*: Balkans. Described from Arva River Valley (Hungary). Type in Budapest.

735 *Series 4. Racemuliferae* Schischk.—Leaves almost entire, lower leaves short-petiolate; ligulate florets 8–10, yellow.

32. *S. racemulifer* Pavl. in Vestn. Akad. Nauk. Kaz. SSR, No. 8 (1950) 21.—*S. doriaeformis* var. *thyrsoides* Franch. in Ann. Sc. Nat. VI, Bot. XV (1883) 311.—*S. aksuensis* Pavl. in Vestn. Akad. Nauk. Kaz. SSR, No. 4 (73) (1951) 97.—*lc.*: Pavl. op. cit. (1950) 21.

Perennial. Rhizome woody, vertical, many-headed above. Stems few, weakly glaucous, glabrous, sometimes pubescent only in inflorescence, simple or branched above, 45–70 cm high. Leaves ovate or oblong-ovate, 5.0–8.5 cm long and 1.0–3.5 cm wide, glabrous, obtuse or short-acuminate, entire or less often with few teeth, narrowed toward base; basal and lower cauline leaves on short (1 cm long) petiole, withering before flowering, upper leaves sessile. Inflorescence corymbose; capitula on 1.5–4.5 cm long peduncle, with narrowly linear, 0.7–1.0 cm long bracteal leaves. Involucre 6–8 mm long and 6–10 mm in dia; outer involucral bracts 2–4, linear, 4–5 mm long, inner bracts oblong-obovate, 6–8 mm long, acute, glabrous. Ligulate florets 8–10, yellow, twice as long as involucre. Achenes not fully matured, 2–3 mm long, obpyramidal, dark brown. Flowering June to August; fruiting September.

River gravel beds in alpine and subalpine zones (2,300–2,400 m).—*Soviet Central Asia*: Tien Shan (west). Endemic. Described from Talass Alatau Range. Type in Alma-Ata; isotype in Leningrad.

Series 5. Paludosos Schischk.—Stem hollow, densely leafy; leaves unevenly toothed or serrate with acute and upright teeth; ligulate florets 15–18.

33. *S. paludosus* L. Sp. pl. (1753) 870 s. str. var. excl.—*S. paludosus* β . *vulgaris* Ldb. Fl. Ross. II (1845) 640; Schmalh. Fl. II. 89.—*S. paludosus glabriuscula* DC. Prodr. VI (1837) 353.—*S. paludosus* α . *nudiussculus* Ldb. (1845) op. cit.—*S. paludosus grandidens* Rupr. in Bull. XII (1854) 94; Rupr. Fl. ingr. 600.

Perennial. Rhizome long, horizontal or ascending, with long fibrous roots at base of stem. Stem solitary, erect, simple, branched only in inflorescence, glabrous or weakly pubescent, finely sulcate, hollow, 80–200 cm high. Leaves numerous, lower ones withering early, middle and cauline leaves narrowly lanceolate, acute, gradually narrowed toward

base, with sharp upright teeth, dark green and glabrous above, lighter beneath and sparsely pubescent, 10–15 cm long and 1–2 cm wide, upper leaves smaller and narrower, sometimes almost entire. Capitula numerous, in corymbose inflorescence at apices of stem; peduncles 736 weakly arachnoid-hairy. Involucre broadly campanulate, 8 mm long and 10 mm in dia; outer involucre bracts 8–10, linear, usually recurved, glabrous, a half as long as inner ones; inner bracts linear, with narrow scarious margin, subacute, glabrous or weakly arachnoid-hairy. Ligulate florets 15–16, 2–3 times as long as involucre, yellow or orange-yellow. Achenes terete, glabrous, brownish, angular, 3.5–4.0 mm long. Flowering July to August.

Along banks of lakes and marshes, rivers and seas, in willow thickets.—*European part*: Ladoga-Ilmen, Baltic Region, Upper Dnieper. *General distribution*: Scandinavia, Central Europe, Balkans (north). Described from Europe from coastal marshes. Type in London.

34. *S. tataricus* Less. in Linnaea, IX (1834) 192.—*S. lanatus* S.G. Gmelin R. d. Russl. I (1774) 155 non L. (1768) nec Scop. (1771).—*Cineraria aureus* L. Sp. pl. 2 (1763) 1244 non *Senecio aureus* L. (1753).—*S. tomentosus* Hos Fl. Austr. II (1831) 476, non Michx. (1803).—*S. auratus* DC. Prodr. VI (1837) 348.—*S. paludosus hypoleucus* Ldb. Fl. Ross. II (1846–1848) 640.—*S. paludosus auratus* Schmalh. Fl. II (1897) 89.—*S. hypoleucus* Ldb. and Wolosz. Fl. Polon. exs. No. 445.— *Ic.*: S.G. Gmel. loc. cit. tab. 35, fig. 1.—*Fl. Yugo-Vost. Evrop. Ch. SSSR*, Fig. 690.—*Exs.*: Fl. Polon. exs. No. 445.

Perennial. Rhizome creeping, with long, thick, fibrous roots at nodes. Stem solitary, erect, hollow, simple or branched above, densely leafy, finely sulcate, arachnoid-woolly, 60–200 cm high. Lower cauline leaves withering early; middle and upper leaves narrowly oblong, lanceolate, or linear-lanceolate, acute, narrowed toward base, sessile, unevenly toothed or serrate with acute, upright teeth, green above and weakly arachnoid-woolly, floccose-white-tomentose beneath, 8–15 cm long and 1–3 cm wide. Capitula 4–7 or numerous, at apices of stem on arachnoid-hairy peduncles, in corymbose panicle. Involucre broadly campanulate, about 8 mm long and 12–15 mm in dia; outer involucre bracts linear, 8–10, a half as long as inner; inner bracts lanceolate, acuminate, scarious along margin, with black spot at apex, 18–20; all involucre bracts arachnoid-hairy. Ligulate florets yellow or orange-yellow, about 18, 1.5–2 times as long as involucre. Achenes glabrous, terete, ribbed, 3.5 mm long. Flowering June to July.

Floodplain meadows, on mounds among alders, banks of lakes.—*European part*: Dvina-Pechora, Ladoga-Ilmen (Novgorod), Baltic Region, Volga-Kama, Trans-Volga, Upper Dnieper, Upper Volga,



- 739 Volga-Don, Middle Dnieper, Black Sea Region, Lower Don, Lower Volga; *Western Siberia*: Ob River Area, Upper Tobol. *General distribution*: Central Europe. Described from marshes along Ilek River. Type was in Berlin.

Section 5. Oliganthi Boiss. Fl. or. III (1875) 385 pp. emend. Sof. in Izv. Akad. Nauk Azerb. SSR (1957) 88.—Plants perennial; leaves pinnately cut or undivided; inflorescence corymbose-paniculate; involucre cylindrical, 3–6 mm wide, usually with 4–6 inner and a few outer involucre bracts; capitula few-flowered with 5–15 flowers, ligulate florets absent, less often 1–3(5).

35. *S. pojarkovae* Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XV (1953) 409.—*S. stenocephalus* Boiss. Fl. or. III (1875) 408, non Maxim. (1871); Grossh. Fl. Kavk. IV, 151.—**Exs.**: GRF No. 3247.

Perennial. Whole plant glabrous; rhizome short, obliquely ascending, covered with long slender roots. Stem usually solitary, somewhat sulcate, densely leafy, branched in inflorescence, 100–150 cm high. Basal leaves withering early, lower leaves short-petiolate, lanceolate or narrowly lanceolate, acute or acuminate, narrowed toward base, almost uniformly toothed with short, acute teeth; cauline leaves identical with lower leaves, 6–24 cm long and 1–5 cm wide; uppermost leaves shorter, linear-lanceolate, sessile or gradually narrowed into short petiole. Capitula numerous, with 4–5 flowers, forming large corymbose panicle; common peduncles obliquely upright, with very short, indistinctly arachnoid hairs, some peduncles as long as, longer or shorter than involucre, with few, linear, scale-like bracteal leaves. Involucre campanulate, 4.5–6.0 mm long and 2.0–2.5 mm in dia; outer involucre bracts 1–2, very small, sometimes absent; inner bracts 5, linear-oblong, obtuse. Tubular florets whitish, with 4 teeth; ligulate florets lacking. Achenes glabrous, terete, 3.0–3.5 mm long; pappus white, twice as long as involucre. Flowering end of June to July.

Subalpine meadows, edges of mountain forests on river gravel beds, at 1,100–2,100 m.—*Caucasus*: Ciscaucasia, Dagestan, Western Transcaucasia. Endemic. Described from Dagestan from Dindidad Mountain. Type in Geneva.

36. *S. rhombifolius* (Willd.) Sch. Bip. in Flora, XXVIII (1845) 499.—*S. platyphyllus* DC. Prodr. VI (1837) 352; Ldb. Fl. Ross II, 637; Boiss. Fl. or. III, 409; Grossh. Fl. Kavk. IV, 151.—*Cacalia macrophylla* MB. Fl. taur.-cauc. II (1808) 286, non *Senecio macrophyllus* DC. (1837).—*C. rhombifolia* Willd. Enum. Horti Berol. (1809) 850; DC. Prodr. VI, 331.

Perennial. Whole plant glabrous; rhizome horizontal, densely covered with fibrous root. Stem solitary, solid, sulcate, branched in inflorescence, 100–120 cm high. Basal and lower cauline leaves long-petiolate, their laminas undivided, with unequal acute teeth, acuminate, at base deeply cordate, 14–15 cm long and 20–25 cm wide; middle cauline leaves like basal but smaller, with short, sometimes expanded petiole, upper leaves lanceolate, basally attenuate, reduced. Capitula cylindrical, with 5–8 flowers, numerous, in corymbose panicle. Involucre 5 mm long and 2 mm in dia; outer involucre bracts linear-subulate, 1–3, a third to a half as long as inner ones; inner bracts 4–5, linear-oblong, obtuse. Ligulate florets absent. Achenes terete, glabrous, weakly ribbed, about 3 mm long; pappus brownish, almost as long as tubular florets. Flowering July to August; fruiting August to September.

In scrubs, banks of mountain streams, mixed pine birch-beech and mountain pine forests, talus, at 1,800–2,500 m in alpine meadows.—*Caucasus*: Ciscaucasus, Dagestan, Eastern Transcaucasia, Western Transcaucasia. Endemic. Described from the Caucasus. Type in Leningrad.

Economic Importance. The rhizomes and leaves contain an alkaloid—platyphylline—that dilates the pupil.

37. *S. platyphylloides* Somm. and Lev. in Tr. Bot. Sada, XII (1892) 153; Grossh. Fl. Kavk. IV, 251.—*S. platyphylli* var. *platyphylloides* (Somm. and Lev.) Grossh. Opred. Rast. Kavk. (1949) 468.—*S. similiflorus* Kolak. Fl. Abkh. IV (1949) 252.—*S. platyphylli* Boiss. Fl. or. III (1872) 4098, quo ad pl. lazicam.—*Ic.*: Kolak. Fl. Abkh. IV, Plate XXV.

Perennial. Whole plant glabrous; rhizome thick, horizontal. Stem solitary, erect, sulcate, branched above, 50–75 cm high. Basal and lower cauline leaves long-petiolate, their laminas deltoid-reniform, with sharp teeth, usually acute, at base deeply cordate, 10–17 cm long and 15–30 cm wide; middle cauline leaves identical to basal in shape, short-petiolate, usually with large auricles; uppermost leaves lanceolate or ovate, sometimes almost entire, narrowed toward base. Capitula numerous, with 10–15 flowers, 5–7 mm long and about 3 mm in dia. Outer involucre bracts 1–3, linear-subulate, a third to a half as long as inner; inner bracts linear-oblong, 5–8. Ligulate florets absent. Achenes terete, glabrous, weakly ribbed, 4–5 mm long; pappus brownish, almost as long as tubular florets. Flowering July to August.

Mountain birch forests, subalpine tall-herb meadows, Caucasian rhododendron scrubs, at 1,500–2,500 m.—*Caucasus*: Ciscaucasia (west), Western Transcaucasia. *General distribution*: Asia Minor (? Artvin

District, Pontic Range). Described from Danais-Paraul. Type in Florence.

Note. This species is very close to the preceding species, but has morphological differences and a rather separate range (mainly Western Transcaucasia).

- 741 38. *S. paucilobus* DC. Prodr. VI (1837) 352; Boiss. Fl. or III, 41; Grossh. Opred. Rast. Kavk. 470.

Perennial. Whole plant covered with thin, appressed arachnoid-hairs. Stems few, arising from thick rhizome, somewhat branched in inflorescence, 50–60 cm high. Lower cauline leaves long-petiolate, petiole twice as long as lamina; lamina broadly ovate, 7–8 cm long and 5–6 cm wide, green, arachnoid-hairy, densely whitish-arachnoid-hairy beneath, usually pinnately cut, with 2 pairs of lobes, terminal lobe larger, basally truncate or almost cordate, with uneven coarse teeth, lateral lobes oblong, toothed, lower lobes shorter, remote; upper cauline leaves smaller, short-petiolate. Inflorescence dense or lax corymb; capitula numerous, conical-cylindrical, 7 mm long and 2 mm in dia, glabrous. Outer involucre bracts few, obtuse, many times into inner oblong bracts. Ligulate florets absent. Achenes terete, ribbed, glabrous, about 3.5 mm long. Flowering July to August.

Stony slopes at about 2,300 m.—*Caucasus*: Southern Transcaucasia. *General distribution*: Armenia and Kurdistan, Iran. Described from route to India from Iran. Type in Geneva.

39. *S. othonnae* MB. Fl. taur.-cauc. II (1808) 308, III, 570; Ldb. Fl. Ross. II, 637; Boiss. Fl. or III, 410; Grossh. Fl. Kavk. IV, 153.—*S. rariflorus* C. Koch, in Linnaea, XVII (1843) 47.—*S. pinnatus* Sch. Bip. in Flora, XXVIII (1845) 499, non Poir. (1817).—*S. othonnae* var. *genuinus* C. Koch and var. *rariflorus* C. Koch, in Linnaea, XXIV (1851) 366.—*Cacalia pinnata* Willd. Enum. Horti Berol. (1809) 580.—*Jacobaea othonnae* C.A.M. Verzeichn. Pfl. Cauc. (1831) 81.—*Ic.*: Parsa, Fl. de Iran. III (1943) fig. 187.

Perennial. Rhizome thick, ascending, covered with long roots. Stem glabrous, sulcate, branched in inflorescence, 80–175 (200) cm high. Basal and lower cauline leaves short-petiolate, including petiole 40–50 cm long and 12–15(25) cm wide, their laminas oblong, simple pinnate or almost twice pinnate, with 6–10 pairs of lobes, sessile and somewhat decurrent on rachis, with deeply pinnatifid or pinnately cut into ovate-oblong or oblong-lanceolate, acute lobes with irregularly toothed margin, pubescent beneath, glabrous above; upper leaves sessile, smaller, with narrower lobes. Capitula with 5–8 flowers, numerous, forming corymbose panicle. Involucre cylindrical, 4 mm long and 2 mm in dia;

outer involucre bracts 1–3, linear, a third to a half as long as inner ones; inner bracts oblong, with scarious margin, apically obtuse, with black spot, dorsally pubescent. Ligulate florets yellow, 1–2, 8–10 mm long and 2.0–2.5 mm wide. Achenes terete, angular-ribbed, pubescent, 2.0–2.5 mm long; pappus brownish, as long as tubular florets. Flowering July to August; fruiting August to September.

Mountain forests, their edges banks of mountain streams, at 1,200–2,300 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern, Western, and Southern Transcaucasia, Talysh. *General distribution*: Armenia and Kurdistan, Iran. Described from Georgia. Type in Leningrad.

Note. This species has been reported by Boissier and other authors also for the Balkans, but it is replaced there by another similar species, *S. anomalus* DC.

Section 6. Pseudo-Oliganthi Sof. in Izv. Akad. Nauk Azerb. SSR (1957) 88.—Plants perennial; usually glabrous or subglabrous; leaves undivided, with toothed or serrate margin. Inflorescence corymbose; inner involucre bracts 6–12; capitula many-flowered (not less than 15); ligulate florets 5–8; achenes glabrous.

40. **A. nemorensis** L. Sp. pl. (1753) 870; Ldb. Fl. Alt. IV, 109; Ldb. Fl. Ross. II, 641, p.—*S. octoglossus* DC. Prodr. VI (1837) 354; Fisch. and Mey. Ind. sem. Horti Petropol. VIII (1841) 71; Kryl. Fl. Zap. Sib. XI, 2850.—M. Popov, Fl. Sr. Sib. II, 744.—*S. nemorensis* var. *turczaninovii* Hara in Bot. Mag. Tokyo, LII (1938) 126.—*S. fuchsii** *turczaninovii* DC. op. cit. (1837) 353.—*S. nemorensis* var. *polyglossus* Rupr. Fl. Samoied. cisural. (1845) 43.—*S. nemorensis octoglossus* C. Koch, Taschenb. (1844) 284; Ldb. Fl. Ross. II, 641; Kryl. Fl. Alt. III, 676.—*S. nemorensis* subsp. *macer* Printz. The vegetation of the Siberian Mongolian frontiers. (1921) 428.—*S. obscurus* Fisch. ex Ldb. Fl. Ross. II (1845–1846) 638; ?Turcz. in Bull. Soc. Nat. Mosc. XX (1847) 220.—*S. octoglossus macer* DC. op. cit. (1837) 354.— **Ic.**: Rchb. Ic. Fl. Germ. XVI (1853) t. 971; Printz, op. cit. tab. XIV, fig. 1 (photo).— **Exs.**: GRF No. 1224; Fellm. Pl. arct. No. 136.

Perennial. Rhizome short, creeping, covered with fibrous root. Stem erect, branched above, weakly hairy or subglabrous, 50–150 cm high and up to 1 cm thick in lower part, often reddish. Leaves ovate-lanceolate or ovate, 5–22 cm long and 1–7 cm wide, with short and straight teeth, less often teeth long, 3–8 mm long and curved (f. *longidentatus* Serg.), pubescent beneath or subglabrous; lower leaves on petioles a half as long as lamina; middle leaves on short and

**fuchsii* in Russian original—General Editor.

broadened petioles; upper leaves smaller, sessile. Inflorescence corymbose. Involucre 5–6 mm long and 4–5 mm in dia; involucre bracts subglabrous or slightly hairy; outer bracts 4–5, linear, as long as inner ones; inner bracts lanceolate, apically brownish and ciliate. Ligulate florets 8–10(13), ligules 12–18 mm long and 4–5 mm wide. Achenes glabrous, ribbed, 4.0–4.5 mm long. Flowering June to August.

In coniferous and birch aspen forests, their edges, in pine woodlands, scrubs, meadows along edges of marshes, river banks, mountains ascending almost to the upper treeline.—*Arctic*: Arctic Europe (Kanin Peninsula, Bolshezemelskaya tundra, Arctic Urals—743 Usa and Sablya rivers); *European part*: Dvina-Pechora, Karelia-Lapland, Baltic Region? Ladoga-Ilmen, Volga-Kama, Upper Dnieper, Trans-Volga, Upper Dniester; *Western Siberia*: All regions; *Eastern Siberia*: Angara-Sayans, Yenisei, Dauria, Lena-Kolyma; *Far East*: Zeya-Bureya, Ussuri, Uda River Area, Okhotsk, Sakhalin (and Kuril Islands); *Soviet Central Asia*: Aralo-Caspian Region (north), Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Central Europe, Scandinavia, Mongolia, Northeastern China. Described from Germany and Siberian forests. Type in London.

Note. Given its eight ligulate florets, De Candolle proposed to name this species *S. octoglossus* instead of *S. nemorensis*. But in Linnaeus's description of *S. nemorensis* it is also indicated that this species has eight ligulate florets. It seems to me that the name proposed by Linnaeus should be retained.

41. *S. iljinii* Schischk. sp. nov. in Addenda, XXV, 882.

Perennial. Stem erect, simple, branched only in inflorescence, solid, pubescent with white crisped hairs, 40–50 cm high, densely leafy. Leaves ovate, sessile or short-petiolate, acute, irregularly toothed with large, usually obtuse teeth, dark green above, lighter beneath, subglabrous or scarcely arachnoid-hairy, 8–12 cm long and 3–5 cm wide. Inflorescence paniculate, with numerous capitula; peduncles densely white-pubescent. Involucre about 5 mm long and almost as much in dia; outer involucre bracts 3–4, linear, slightly longer than inner bracts and appressed to them; inner bracts ovate, subacute, 8–10, like outer bracts, dorsally covered with short and curly hairs, ciliate on margin. Ligulate florets 8, yellow, 3 times as long as involucre. Young achenes glabrous, 3–4 mm long. Flowering August.

Mountain slopes.—*Soviet Central Asia*: Dzhungaria-Tarbagatai. Endemic. Described from Dzharkent District from Tyshkan River. Type in Leningrad.

42. ***S. propinquus*** Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XV (1953) 406.—*S. fuchsii* Grossh. Fl. Kavk. IV (1934) 152, non Gmel.—*S. jacquinianus* Grossh. Fl. Kavk. IV, 151, non Rchb.

Perennial. Rhizome short, densely covered with fibrous roots. Stem solitary, straight or indistinctly flexuous, slightly violet, glabrous or sparsely hairy, sulcate, densely leafy, branched in inflorescence, 80–150 cm high. Basal leaves withering early; cauline leaves ovate, acute, or subacuminate, narrowing toward base, sessile; middle cauline leaves 10–20 cm long and 3–8 cm wide, cartilaginously toothed, sometimes with 2 teeth, short-ciliate between teeth, dark green above and usually glabrous, paler beneath and pubescent along veins, less often subglabrous. Inflorescence corymbose; branches of inflorescence and peduncles arachnoid-hairy; capitula mostly numerous. Involucre 5 mm long and 3.5–4.0 mm in dia; outer involucre bracts about 5, narrowly
744 linear, longer than inner bracts, crisped-ciliate along margins; inner bracts oblong, subobtusate, with an indistinct dark spot at apex, scarious along margin and sparsely hairy. Ligulate florets 5, yellow, 12–14 mm long and 2–3 mm wide. Achenes terete, glabrous, ribbed, about 4 mm long; pappus white or brownish, almost as long as tubular florets. Flowering June to July; fruiting August to September.

Mountain pine, birch, pine-birch-beech and fir-spruce forests, their edges, mountain meadows, thickets of rhododendron and box trees, at 800–2,400 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern and Western Transcaucasia. Endemic. Described from Kazbek Mountain. Type in Leningrad.

43. ***S. lapsanoides*** DC. Prodr. VI (1837) 348 (“*lampsanoides*”); Ldb. Fl. Ross. II, 633; Boiss. Fl. or. III, 408; Grossh. Fl. Kavk. IV, 150.—*Cineraria parviflora* MB. Fl. taur.-cauc. II (1808) 316; Willd. Enum. Horti Berol. (1808) 893, non *S. parviflorus* All. (1785).—*Exs.*: GRF No. 1328.

Perennial. Whole plant glabrous; rhizome obliquely ascending, 0.8 mm thick. Stem erect, finely sulcate, simple, branched only in inflorescence, 35–120 cm high. Basal and lower cauline leaves with petioles longer than lamina, gradually expanded toward base into semiamplexicaul sheath, withering early, their laminas undivided, ovate-cordate, green and lustrous above, paler beneath, acute or subobtusate, with broad, somewhat obtuse teeth, 4–8 cm long and 1.5–12 cm wide; middle and upper leaves sessile or short-petiolate; with broad amplexicaul auricles, oblong-lanceolate or lanceolate, acute, with deltoid, acute teeth. Capitula 4–50, with 15–20 flowers. Involucre obconical, 8 mm long and 4 mm in dia; outer involucre bracts lacking, inner oblong linear, obtuse or subacute, with very short hairs and usually

a black spot at apex, membranous on margin. Ligulate florets yellow, 5–6, 8–10 mm long, and 2–3 mm wide. Achenes ribbed, glabrous, oblong-terete, 4.5 mm long; pappus brownish, slightly shorter than tubular florets. Flowering July; fruiting August.

Base of rocks, on cliffs in mountain birch and pine forests in subalpine and alpine zone, at 1,500–2,400 m.—*Caucasus*: Ciscaucasia, Central Caucasus, Eastern Transcaucasia, Dagestan. Endemic. Described from Mount Kazbek. Type in Geneva.

44. *S. quinqueligulatus* Winkl. in Del. sem. quae hortus bot. imp. Petropol. pro mutua commutatione offert (1881) 15; O. and B. Fedtsch. Perech. Rast. Turk. IV, 218.

745 Perennial. Root adventitious. Whole plant subglabrous. Stem branched from base, about 40 cm high. Leaves oblong or ovate, basally narrowed into petiole, unevenly toothed and indistinctly ciliate, 3–8 cm long and 1–5 cm wide, somewhat acuminate. Capitula at apices of stem and branches, forming lax panicle. Involucre 2-rowed; outer involucre bracts 2–3, linear, short-ciliate along margin, longer than inner; inner bracts ovate, acuminate, dark brown. Ligulate florets 5, yellow, 2.0–2.5 times as long as involucre. Achenes glabrous. Flowering June to July.

Mountain slopes.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau-Kashgaria), Tien Shan (Muzart and Issyk-Kul). Endemic. Described from cultivated specimens raised from seeds obtained from Dzhungarian Alatau (Kashgaria) and Tien Shan (Muzart). Type in Leningrad.

Note. Until now this plant is known only from specimens raised in the St. Petersburg Botanical Garden from seeds obtained by Regel from the Dzhungarian Alatau and Tien Shan. In 1959, one more specimen of this plant was obtained from the Main Botanical Garden of the Academy of Sciences in Moscow, grown from seeds collected near Lake Issyk-Kul (Tien Shan).

45. *S. fuchsii* K. Gmel. Fl. Badens. III (1808) 444.—*S. nemorensis* γ. *fuchsii* Ldb. Fl. Ross. II (1844–1846) 641; Boiss. Fl. or. III, 408.—? *S. ovatus* Willd. Sp. pl. III (1800) 2004.—*Jacobaea fuchsii* C.A.M. Verzeichn. Pfl. Cauc. (1831) 81, quo ad nom.—**lc.**: Rchb. Pl. crit. III, t. 293.

Perennial. Rhizome slender, horizontal or ascending, covered with slender and long roots. Stem solitary, angular-sulcate, more or less purple, weakly flexuous, branched in inflorescence, 70–100 cm high. Basal leaves withering early; cauline leaves numerous, short-petiolate, ovate-lanceolate, 15–20 cm long and 4–6 cm wide, dark green above, lighter beneath, glabrous on both sides, acuminate, toothed, sometimes

with 2 teeth, with acute, deltoid teeth, short-ciliate between teeth; uppermost leaves linear-lanceolate, smaller. Capitula more or less numerous, forming corymbose inflorescence. Involucre 6 mm long and about 4 mm in dia, glabrous; outer involucre bracts 5–6, narrowly linear, somewhat shorter or slightly longer than inner ones; inner bracts linear, 9–10; all bracts with blackish apices. Ligulate florets yellow, 5, linear, 12 mm long and about 2 mm wide. Achenes glabrous, terete, about 5 mm long. Flowering July to August, fruiting September.

Open forests and edges.—Upper Dniester (Carpathians). *General distribution*: Central Europe, Balkans. Described from Alsace. Type in Karlsruhe.

46. ***S. fluviatilis*** Waller. in Linnaea, XIV (1840) 64; Bordz. in Vestn. Tifl. Bot. Sada, 4–5 (1930) 64.—Grossh. Fl. Kavk. IV, 151.—*S. sarracenicus* L. Sp. pl. (1753) 871, ex. p.; Ldb. Ross. II, 640; Schmalh. Fl. II, 89; Kryl. Fl. Zap. Sib. XI, 2850.—*S. sarracenicus* β . *sclerophyllus* C. Koch, in Linnaea, XXIV (1850) 359.—*S. hajastanicus* Sof. in Izv. Akad. Nauk Azerb. SSR, I (1957) 86.—*Jacobaea sarracenicum* Moench. Meth. (1794) 588.—**lc.**: Sof. loc. cit. Fig. 2; Syreistsch. Ill. Fl. Mosk. Gub. III, 28 (1910).—**Exs.**: GRF No. 1478.

Perennial. Rhizome creeping or ascending. Stem erect, densely leafy, sparsely branched and sparsely hairy above, glabrous, elsewhere, sulcate, 100–200 cm high. Leaves glabrous, sessile, elliptical-lanceolate or almost lanceolate, 12–20 cm long and 1.5–4.0 cm wide, acute, cuneately narrowed toward base, serrate-toothed and short-ciliate, teeth acute, antrorse. Inflorescence corymbose; capitula numerous. Involucre pubescent, 6 mm long and 3.5 mm in dia, 2-rowed, campanulate-cylindrical; outer involucre bracts 3–5, linear, as long as inner ones; inner bracts lanceolate, apically ciliate and with black spot. Ligulate florets 6–8, bright yellow, ligule linear-oblong, 1.0–1.2 cm long and 2.5–3.0 cm wide. Achenes ribbed, 4 mm long, usually glabrous. Flowering June to July; fruiting August to September.

Shrubby thickets along riverbanks, riverine meadows and willow stands, edges of marshes.—*European part*: Dvina-Pechora (south), Ladoga-Ilmen, Baltic Region, Upper Volga, Volga-Kama, Trans-Volga, Upper Dnieper, Volga-Don, Middle Dnieper, Lower Don, Black Sea Region; *Caucasus*: Southern Transcaucasia; *Western Siberia*: All regions; *Eastern Siberia*: Angara-Sayans; *Soviet Central Asia*: Aralo-Caspian Region, Dzhungaria-Tarbagatai (rarely). *General distribution*: Atlantic and Central Europe, northern Balkans. Described from southern border of Hartz [Mountains]. Type in Berlin.

Note. Recently, Sofieva described the new species *S. hajastanicus* Sof. from the Armenian SSR, of the *S. fluviatilis* Wallr. complex. The

range of this new species is far removed from the range of the latter species, and it would appear that establishing the new species *S. hajastanicus* Sof. was completely justified. However, a careful study of both these species revealed that it is impossible to find any morphological differences between them. In the comparison, the author mentions narrower leaves and shorter and comparatively fewer ligulate florets. But the indicated characters are not confirmed from the material. The leaves are sometimes broader, sometimes narrower; the differences in the number of ligulate florets and their sizes are not supported by the author with any numerical data. I do not think it possible to distinguish a separate species without morphological differences only on the basis of its range alone. It would be more appropriate to consider *S. fluviatilis* Wallr. as a relict in Armenia, persisting since the Ice Age. In fact in Southern Transcaucasia, many species are known, that in no way differ from the typical northern species and represent a group of disjunct northern relicts.

Section 7. Extremiorientales Schischk. sect. n. in Addenda XXV, 883.—Plants 1–2 m high, with palmate or undivided leaves, often with large auricles. Capitula numerous, small; involucre about 5 mm long and as much in dia; achenes glabrous, 3–5 mm long.

- 747 47. ***S. cannabifolius*** Less. in Linnaea, VI (1831) 242; DC. Prodr. VI, 349; S. Turcz. Fl. baic.-dahur. II, 92.—*S. palmatus* Pall. Reise, III (1776) 321, nom. nud.; Ldb. Fl. Ross. II, 636, descr. non La Peyrouse (1818) nec Less. (1823); Kom. Fl. Kamch. III, 331; Hult. Fl. of Kamchatka, IV, 199.—*Solidago palmata* Pall. Reise. III (1776) 437, nom. nud.—*Senecio dahuricus* Fisch. ex DC. Prodr. VI (1837) 349, pro syn.; Turcz. in Bull. Soc. Nat. Mosc. XX, 2, 19, non Schultz Bip.

Perennial. Rhizome short, covered with numerous slender roots. Stem erect, simple, finely sulcate, glabrous, 1–2 m high. Leaves almost sessile, cuneately narrowed toward base, and with or without round-falcate auricles, oblong-lanceolate, acuminate, with 2–3 pinnately divided lobes on each side, serrate, with upright teeth, decurrent, dark green and glabrous above, lighter beneath, 8–10 cm long and 1–2 (5) cm wide. Inflorescence at stem apex, paniculate corymbose; capitula on more or less long, slender; peduncles, with small subulate bracteal leaves. Involucre 5 mm long and 5 mm in dia above; inner involucre bracts ovate-lanceolate, sparsely pubescent, subacute. Ligulate florets 5, yellow, 10 mm long and 2 mm wide. Achenes glabrous 3.5–4.0 mm long; pappus ginger-colored. Flowering July.

Scrubs, coastal forests, floodplain meadows, reed thickets, edges of deciduous forests.—*Eastern Siberia*: Dauria, Lena-Kolyma; *Far East*:

Zeya-Bureya, Ussuri, Kamchatka, Sakhalin (Kuril Islands). *General distribution*: China, Japan, Beringia. Described from Kamchatka and Bering islands. Type in Berlin.

Economic Importance. In spring, the rhizome of the plant is used in raw form as food by the people of Kamchatka, and its leaves, dried and ground to a powder, are sometimes added to food.

48. **S. litvinovii** Schischk. nom. nov.—*S. otophorus* Maxim. Mélang. biol. VIII (1871) 11, non Wedd. (1855); Kom. Fl. Manchzh. III. 708; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1057.

Perennial. Rhizome short, covered with numerous slender roots. Stem erect, simple, finely sulcate, glabrous, 80–120 cm high. Basal and lower cauline leaves withering early, more or less long-petiolate, 20 cm long and 5–7 cm wide; middle cauline leaves ovate, dark green and glabrous above, lighter beneath and crisped-hairy, particularly on veins, acuminate, unevenly toothed with sharp, upright teeth, narrowed toward base into short petiole or sessile, with 2 oblong or suborbicular auricles recurved and adpressed to stem; upper leaves smaller, lanceolate, uppermost leaves linear, almost entire. Capitula numerous, in corymbose panicle, inflorescence branches and peduncles pubescent. Involucre campanulate, 5 mm long and about 5 mm in dia; outer involucre bracts about 6, linear, pubescent, a third to a half as long as inner; inner bracts oblong, acute, with narrow scarious margin, dorsally
748 pubescent. Ligulate florets 5–8, yellow, 10–12 mm long and 3 mm wide. Achenes terete, ribbed, glabrous, 3 mm long and about 1 mm wide; pappus brownish, 8–9 mm long. Flowering July to August; fruiting September.

Mixed montane forests, stream banks, edges of alder forests.—*Far East*: Ussuri. *General distribution*: Northeastern China, Japan. Described from vicinity of Vladivostok and from Japan. Type in Leningrad.

Section 8. Carniolicus Schischk. sect. nov. in Addenda XXV, 883.—Basal leaves long persistent, pinnately divided, with broadly linear lobes; inner involucre bracts with black spot at apex; ligulate florets 2–4, dark yellow; achenes glabrous; pappus sordid brown.

49. **S. carniolicus** Willd. Sp. pl. III, 3 (1800) 1993; DC. Prodr. VI, 356.—*S. incanus* Scop. Fl. Carn. ed. 2 (1772) non L. (1753).—*S. incanus* subsp. *carniolicus* (Willd.) Br. Bl. efr. Dostal, Kvetena CSR (1950) 1633.—*S. incanus* var. *carniolicus* Heat Fl. Engadine (1841) tab. 121.—*Jacobaea carniolica* Schrank in Denkschr. Acad. Muench. (1814) 316.—**lc.**: Rchb. Ic. Fl. Germ. XVI, tab. 698 (1853); Hegi and

Dunc. Alp. Fl. (1913) tab. 29; Dostal, op. cit. Fig. 537, 2; Javorka and Csapody, Iconogr. Fl. Hung. (1933) 530.—**Exs.:** Fl. Hung. exs. Cent. 1, No. 351; Fl. exs. Reipubl. Bohem.-Sloven. No. 959; Fl. Polon. exs. No. 351.

Perennial. Rhizome ascending, 0.4–0.5 cm thick. Stem ascending at base or erect, simple, arachnoid-floccose-hairy, slightly violet, finely sulcate, 6–20 cm high. Basal leaves more or less numerous, long-persistent, pinnately divided (not up to midrib), with petiole usually longer than lamina, subglabrous above, finely arachnoid-hairy beneath and bluish-dark bluish, including petiole, 5–10 cm long and 1–2 cm wide; leaf lobes broadly linear, obtuse, with occasional teeth or entire; cauline leaves 2–4(8), like basal, but smaller, lower among these usually long-petiolate, upper sessile. Inflorescence corymbose or lax, head of 5–15 capitula on short peduncles, arachnoid-hairy and with linear, acuminate, bracteal leaves. Involucre 5 mm long and 6–7 mm in dia, 2 rowed; inner involucre bracts lanceolate, subacute, dorsally finely arachnoid-hairy, with dark violet or almost black spot at apex. Ligulate florets 2–4, dark yellow, somewhat longer than involucre; pappus dirty brown. Achenes terete, glabrous, about 3 mm long. Flowering July to August.

Stony slopes, granite rocks, and meadows in alpine zone at 1,700–2,300 m.—*European part:* Upper Dniester (Carpathians). *General distribution:* Balkans, mountains of Central Europe. Described from Carnolia. Type in Berlin.

- 749 *Section 9. Montani* Schischk. sect. n. in Addenda XXV, 883.—Basal leaves with petioles as long as lamina or 2–3 times as long, ovate, irregularly toothed with coarse teeth or pinnately divided; outer involucre bracts 2–8, linear; ligulate florets yellow, about 10–12; achenes glabrous.

50. *S. tianschanicus* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, VI (1879) 311.

Perennial. Rhizome short, with numerous long roots. Stem erect, sometimes at base ascending, simple, 5–20 cm high, glabrous or arachnoid-hairy, sulcate. Lower leaves ovate or ovate-lanceolate, with long petioles often many times as long as lamina, their laminae 1.5–4.0 cm long and 0.6–1.2 cm wide, obtuse or subacute, glabrous above, usually arachnoid-hairy beneath, irregularly toothed with coarse teeth or deeply pinnatifid; upper leaves sessile. Capitula in corymbose inflorescence or even solitary. Involucre 7–8 mm long and 5–6 mm in dia; outer involucre bracts 2–8, linear, a fourth to two-thirds as long as inner; inner bracts broadly linear; all bracts weakly pubescent or even subglabrous. Ligulate florets yellow, about 10, twice as long as

involucre. Achenes glabrous, ribbed, about 3.5 mm long. Flowering July to August; fruiting September.

Old moraines, gravel beds, scrubs, forest edges at treeline, on stony slopes.—*Soviet Central Asia*: Tien Shan. *General distribution*: Dzhungaria-Kashgaria (Sin-Tsian). Described from Tien Shan. (Tersk Alatau near Sary-Kungei). Type in Leningrad.

51. ***S. renardii*** Winkl. in Trautv. Rgl. Maxim. and Winkl. Decas pl. nov. (1882) 6.—**Exs.**: GRF No. 4199.

Perennial. Rhizome obliquely ascending, 0.5–1.0 cm thick, whole plant densely floccose-hairy. Stems many, often violet below, erect, 60–90 cm high, somewhat branched from middle. Basal and lower cauline leaves obovate or ovate-lanceolate, with petiole as long as lamina or longer, expanded at base, semiamplexicaul, their laminae 8 cm long and 4–6 cm wide, subobtusely, irregularly toothed, sometimes pinnately divided at base; upper leaves smaller, sessile, semiamplexicaul, deeply toothed or almost lyrate. Inflorescence corymbose panicle; capitula usually numerous. Involucre 7 mm long and about 10 mm in dia; outer involucral bracts about 5, linear-subulate, half as long as oblong-lanceolate, acuminate, inner bracts. Ligulate florets about 12, yellow, 1.5–2 times as long as involucre. Achenes glabrous, ribbed, about 3.5 mm long. Flowering July to August; fruiting September. (Plate XXXIII, Fig. 2).

750 Juniper stands at treeline, stony beds of streams, on loess slopes and rocks at 2,000–3,500 m.—*Soviet Central Asia*: Pamiro-Alai Region. *General distribution*: Indo-Himalayas (Kashmir). Described from Baldzhuan, Darvaz and other places. Type in Leningrad.

Section 10. Scaposi (Hoffm.) Schischk. ex Kryl. Fl. Zap. Sib. XI (1949) 2840; Popov, Fl. Sr. Sib. II, 748.—*Scaposi* Hoffm. in Pflanzenfam. IV, 5 (1889) 297 p. p.; Addenda XXV, 883.—Perennial low herbs; stem always with single capitulum; leaves pinnate or lyrate; high-mountain wholly glabrous plants.

52. ***S. resedifolius*** Less. in Linnaea, VI (1831) 243; Ldb. Fl. Ross. II, 631; Turcz. Fl. baic.-dahur. II, 88; Kryl. Fl. Zap. Sib. XI, 2840.—*S. resedifolius* β . *lyratus* DC. Prodr. VI (1837) 347.—*S. resedifolius* α . *genuina* v. *multicaulis* δ . *multiflora* Rgl. in Bull. Soc. Nat.-Mosc. XL (1867) 429.—*S. lyratus* Turcz. in Bull. Soc. Nat. Mosc. V (1838) non L. fil. (1791).—*Cineraria heterophylla* Fisch. in Mém. Soc. Nat. Mosc. III (1812) 79, non *Senecio heterophyllus* Thunb. (1794).—*C. lyrata* Ldb. in Mém. Acad. Sc. Pétersb. V (1815) 576.—**lc.**: Rchb. Pl. crit. II, t. 101, f. 211; Popov. Fl. Sr. Sib. II, Fig. 88.

Perennial. Whole plant glabrous; rhizome thick. Stems solitary or few, simple, 5–20 cm high, always terminating into single capitulum. Basal leaves almost round, with 10–20 cm long and as wide lamina, with coarse and round teeth, less often almost entire, abruptly narrowed at base into long petiole; lower and middle cauline leaves lyrate, pinnately divided or even pinnately lobed; uppermost leaves lanceolate or linear, entire. Involucre 8 mm long and 10–12 mm in dia, usually violet with upper part of stem, in single whorl, with broadly linear involucre bracts. Ligulate florets yellow, often with violet veins, 2.5 times as long as involucre. Achenes glabrous, brownish, 3.5–4.0 mm long, finely ribbed.

Moss-lichen and rubbly tundras near glaciers and snow in alpine zone (2,500–3,000 m), and in Arctic.—*Arctic*: Arctic Europe, Novaya Zemlya, northern Urals, Arctic Siberia, Chukotka, Anadyr; *Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, Dauria, Lena-Kolyma; *Far East*: Okhotsk, Kamchatka. *General distribution*: Mongolia, Arctic America. Described from shores of Gulf of St. Lawrence. Type in Berlin(?).

53. ***S. carpathicus*** Herb. Addit. fl. Galic. (1831) 43; Boiss. Fl. or. III, 394; Szafer, Kulcz. Pawl. Rosliny Polskie (1953) 705.—*S. abrotanifolius* Wahlb. Fl. Carp. (1814) 266 non L.—*S. abrotanifolius* var. *carpathicus* Hayek. Prodr. Fl. Balc. II (1931) 679.—*S. monocephalus* Schur. Enum. plant. Transsilv. (1866) 349.—*Herbichia carpathica* Steud. Nomencl. ed. 2, I (1840) 750.—*Senecillis carpathica* Schott in Nym. and Kotschy, Garten-Zeit. Berlin, III (1884) 572.—**751** *Ic.*: Prodan, Fl. determ. et descrt. pl. Roman. II, tab. 111 (1923); Javorka and Csapody, Iconogr. Fl. Hung. 531 (1933), tab. 38 (1934).—**Exs.**: Pl. Polon exs. No. 276.

Perennial. Rhizome long, ascending, 2–3 mm thick. Stems many or solitary, basally ascending, usually purple, simple, glabrous, 10–15 cm high. Leaves crowded in lower half of stem, broadly ovate, 2.5–3.0 cm long and about 1.5 cm wide, with petioles almost as long as lamina, glabrous, twice or almost thrice pinnately cut, terminal lobes lanceolate or linear, 2–5 mm long and 0.5–1.5(2.0) mm wide; middle and upper cauline leaves smaller, simple pinnate, with linear lobes, sessile, often brownish, uppermost leaves linear, acuminate, undivided. Capitulum solitary, at stem apex. Involucre 5–8 mm long and 1.0–1.5 cm in dia; outer involucre bracts 2–5, linear, shorter than inner ones; inner bracts linear-oblong, white-scarious along margin, dorsally somewhat dark. Ligulate florets orange-yellow, oblong, with 3 teeth in upper part, 10 mm long and 1.5–2.0 mm wide. Achenes terete, glabrous, 2.5 mm long. Pappus as long as florets. Flowering August; fruiting September.

Alpine grass-mixed herb meadows, at about 2,000 m.—*European Part*: Upper Dniester (Carpathians, Chernaya Gora [Black Mountain], Petros, and other mountains). *General distribution*: Western Carpathians, Tatry. Described from the Carpathians.

Section 11. Karelinioidei O. and B. Fedtsch. Perech. Rast. IV (1911) 220 nom.; Addenda XXV, 883.—Perennial plants with almost entire, ovate or lanceolate-ovate leaves; inner involucre bracts 8, outer bracts 1–2, or even absent; ligulate florets 3–5, yellow.

54. *S. karelinioides* Winkl. in Tr. Peterb. Bot. Sada, XI (1890) 280.

Perennial. Rhizome woody. Stems numerous, glabrous, only in upper part floccose-hairy, whitish, sulcate, erect, flexuous, 25–30 cm high, leaf axis floccose-hairy. Basal leaves withering early, cauline leaves ovate or lanceolate-ovate, sessile, paired toward apex, almost entire, 5–6 cm long and 3 cm wide; upper leaves smaller; bracteal leaves linear or subulate. Capitula numerous, forming broadly corymbose inflorescence. Involucre campanulate-cylindrical, 6 mm long and 6 mm in dia in upper part; outer involucre bracts 1–2, or even absent, linear; inner bracts 8, oblong, herbaceous, with wide scarious border and finely ciliate in upper part, sharply arachnoid-hairy on dorsal side, connate at base. Ligulate florets 3–5, about 6 mm long and 3 mm wide. Achenes obconical, glabrous, ribbed, 2–3 mm long, blackish. Flowering July.

752 Mountain slopes.—*Soviet Central Asia*: Pamiro-Alai. Endemic. Described from vicinity of the village of Dzhegen. Type in Leningrad.

Note. So far only one locality is known. Unfortunately, the collector (Skornyakov) did not mention the habitat conditions.

Section 12. Eriopappus Dumort. Fl. belg. (1827) 65.—*Cineraria* sect. *Holoseris* Rchb. Fl. Germ. exc. (1832) 341.—*Senecio* sect. *Holoserides* DC. Prodr. VI (1837) 362.—Stems hollow; inner involucre bracts numerous, outer bracts absent; ligulate florets 20–25, yellow; achenes glabrous; pappus at flowering slightly longer than tubular florets, during fruiting strongly elongated. Annual or biennial plants.

55. *S. arcticus* Rupr. Fl. Samoied. cisural. (1845) 44.—*L. congestus* β . *intermedius* DC. Prodr. VI (1837) 363.—*S. palustris* (L.) Hook. Fl. bor. am. I (1833) 334, non Velloso (1827); DC. Prodr. VI (1837) 363; Turcz. Fl. baic.-dahur. II, 99; Ldb. Fl. Ross. II, 648; Schmalh. Fl. II, 84 (paluster); Kryl. Fl. Zap. Sib. XI, 2858; Samoied, cisural. 44; Kryl. Fl. Zap. Sib. XI, 2859.—*S. paluster* var. *genuina* Trautv. Fl. Bogan.

(1856) 162; Tr. Peterb. Bot. Sada, VI (1879) 25.—*S. palustris*. v *congestus* Hook. Fl. bor. am. I (1833) 334; Ldb. op. cit. 648; Hult. Fl. of Kamtch. IV, 202.—*S. tubicaulis* Mansf. in Fedde, Repert. XLVIII (1940) 264; Ej. Verzeichn. der. Farn und Blütenpflanzen des Deutschen Reiches (1940) 253; J. Dostal, Kvêtena CSR, 1626.—*S. congestus* var. *palustris* (L.) Nyl. in Uppsala universitets Arsskrift. 7 (1945) 319.—*Othonna palustris* L. Sp. pl. (1753) 924.—*Cineraria palustris* L. Sp. pl. (1763) 1243; Ldb. Fl. Alt. IV, 102.—*C. unctuosus* Gilib. Fl. Lith. III (1781) 211; Exerc. phytol. I (1792) 172, nom. illeg.—**Ис.**: Syreistsch. III. Fl. Mosk. Gub. III (1910) 281; Fedtsch. and Fler. Fl. Evrop. Ross. 995.—**Exs.**: GRF No. 3495.

Biennial, sometimes annual. Roots adventitious. Whole plant glandular-floccose-arachnoid-hairy, less often glabrous in lower part or even all over stem, excluding inflorescence. Stem hollow, simple or branched above, 20–100 cm high, 0.5–2.0 cm thick, densely leafy. Leaves oblong, lanceolate or lanceolate-linear, obtuse, usually pubescent, less often subglabrous, 5–15 cm long and 0.7–5.0 cm wide, sessile, with semiamplexicaul base, sinuate-coarsely toothed or almost pinnately lobed; upper leaves smaller, almost entire; some leaves in rosette narrowed into short petiole, withering before flowering; lower cauline leaves like basal, but smaller, 2–6 cm long; middle and upper leaves sessile, expanded at base and 5–15 mm wide, ovate-lanceolate, long-acuminate, with long, usually entangled hairs along margin, sparsely appressed hairy above, or subglabrous. Capitula in dense or lax corymbose inflorescence; peduncles arachnoid-hairy, with long hairs.

753 Involucre in single whorl, with linear, acuminate, involucre bracts densely hairy only at base, sparsely appressed-hairy in remaining part, sometimes almost glabrous above. Ligulate florets light yellow, 1.0–2.5 mm wide, with 2–3 obtuse teeth or entire. Achenes finely ribbed, glabrous, 1.5–2.0 mm long. Flowering July to August.

Sandy-clayey banks of lakes, marshes and rivers, marshy tundras.—**Arctic**: Arctic Europe, Novaya Zemlya, Arctic Siberia, Chukotka, Anadyr; **European part**: Ladoga-Ilmen, Baltic Region, Upper Volga, Upper Dnieper, Middle Dnieper, Volga-Kama, Volga-Don, Lower Don, Trans-Volga, Black Sea Region (rarely); **Western Siberia**: All regions; **Eastern Siberia**: All regions; **Far East**: Zeya-Bureya, Okhotsk, Kamchatka, Ussuri; **Soviet Central Asia**: Aralo-Caspian Region. **General distribution**: Central Europe, Atlantic Europe, Scandinavia. Described from European Arctic. Type in Leningrad.

Note. I could not find any morphological differences between *S. tubicaulis* Mansf. (= *S. paluster* (L.) Hook.), *S. congestus* (R. Br.) DC., and *S. arcticus* Rupr.

Section 13. Tephroseris (Rchb.) DC. Prodr. VI (1837) 359 ("Tephroserides").—*Cinerariae* sect. *Tephroseris* Rchb. Fl. germ. excurs. (1831) 241.—Leaves undivided, alternate, entire or toothed; inflorescence corymbose or umbellate, very rarely capitulum solitary on stem; involucre campanulate in single whorl; involucre bracts acuminate, flat, green or purple, glabrous to completely pubescent, usually recurved at achene maturity; disk florets tubular, bisexual; peripheral florets ligulate, with 3 teeth in upper part, pistillate. Plant perennial, rarely biennial.

Series 1. Campestris Schischk.—Perennial, usually densely pubescent plants with ovate or lanceolate leaves on short or more or less long petioles; leaves entire or with short, inconspicuous teeth; ligulate florets usually about 12, often orange; achenes pubescent.

56. **S. campester** (Retz.) DC. Prodr. VI (1837) 361. p. min. p.; Ldb. Fl. Ross. II, 646, ex p.; Turcz. Fl. baic.-dahur. II, 23, p.; Trautv. in Tr. Peterb. Bot. Sada, VI, 2 (1880) 552; Schmalh. Fl. II, 85, ex p.; Fedtsch. and Fler. Fl. Evrop. Ross. 995.—*S. kochii* Ldb. Fl. Ross. II (1845–1846) 643.—*S. integrifolius* auct. plur. fl. USSR; Kryl. Fl. Zap. Sib. XI, 2853, non Clairv.—*Cineraria alpina* Retz. Observ. bot. I (1779) 30, non L. *C. campestris* Retz. Prodr. Fl. Scand. ed. 1 (1779) 159.—*C. crispa* γ. *schkurii* Ldb. Fl. Alt. IV (1833) 104.—*Tephroseris campestris* Rchb. Fl. saxon. (1842) 147, quo ad nomen.—**lc.**: Gmel. Fl. sib. II, tab. 71.

Perennial. Rhizome ascending, short, with numerous slender roots.

754 Stem erect, simple, including leaves floccose-arachnoid-hairy or glabrescent, 15–60 cm high. Basal (often withering early) and lowermost cauline leaves with somewhat expanded petiole as long as lamina, longer, or considerably shorter, lamina broadly ovate, ovate, or narrowly ovate, obtuse, with small and large teeth, 2–5(10) cm long and 1–2 cm wide; cauline leaves usually sessile, often semiamplexicaul, oblong or oblong-lanceolate, almost entire or indistinctly toothed, 2–8 cm long and 0.5–2.0 cm wide; upper leaves lanceolate-linear or linear. Inflorescence terminal, usually corymbose or umbellate, of 7–20 capitula, on unequal (0.5–4.5 cm long) peduncles with linear bracts, less often capitula solitary. Involucre 5–6 mm long and 8–10 mm in dia, with linear-lanceolate involucre bracts sometimes persisting up to fruiting. Ligulate florets yellow or light yellow, less often orange, 10–12, 6–10 mm long and about 3 mm wide. Achenes narrowly ovoid, about 2–5 mm long and 0.75 mm wide, white-pubescent. Flowering July to August.



Patchy and clayey tundra, birch groves, juniper thickets, willow stands, rocky slopes, talus, sandy and gravelly banks, wet meadows.—*Arctic*: Arctic Europe, Arctic Siberia (Polar Urals, Yamal Peninsula); *European part*: Karelia-Lapland. Dvina-Pechora; *Western Siberia*: All regions; *Eastern Siberia*: Angara-Sayans. *General distribution*: Scandinavia, Central Europe. Described from Siberia. Type in Stockholm.

Note. The plant is highly variable over its vast range in the degree of pubescence of the stem, leaves and inflorescence, the number of capitula, the color of the ligulate florets, the size of the whole plant and also the leaves.

57. **S. czernjaevii** Mind. in Ukr. Bot. Zhurn. XIII, 3 (1956) 55.—*S. campestris* auct. plur. Fl. Ross. non DC.—**lc.**: Mind. op. cit. Fig. 1, B, p. 56.—**Exs.**: Wol. Fl. Polon. exs. No. 640.

Perennial. Plant with short rhizome. Stem erect, simple, finely sulcate, 25–70 cm high, weakly floccose-arachnoid-hairy or subglabrous. Basal leaves with petioles as long as lamina or twice as long, lamina ovate, obtuse, sinuate-toothed, crenate, or almost entire, 2–8 cm long and 1.0–3.5 cm wide; middle cauline leaves sessile, oblong-lanceolate, acuminate; upper leaves linear-lanceolate. Capitula 5–15, aggregated in umbellate panicle. Involucre in single whorl, slightly arachnoid-woolly; involucre bracts almost linear, 4.5–5.5 mm long and 0.7–1.5 mm wide, acuminate. Ligulate florets, 10–15, yellow, 7–11 mm long and 2–3 mm wide; disk florets numerous, 5.0–7.5 mm long. Achenes almost terete, about 3 mm long, ribbed, densely pubescent; pappus white, 2–3 times as long as achene. Flowering May to July; fruiting July to August.

Groves, scrubs, pine woods, forest edges, steppes and meadows.—*European part*: Ladoga-Ilmen (? introduced), Dvina-Pechora (extreme south), Upper Dnieper, Middle Dnieper, Upper Volga, Volga-Kama, Volga-Don, Trans-Volga, Lower Don, Lower Volga, Bessarabia; *Western Siberia*: Upper Tobol. *General distribution*: Central Europe. Described from Kharkov Region. Type in Kiev.

58. **S. jailicola** Juz. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XV (1953) 399.—*S. aurantiacus* β . *tomentosus* Ldb. Fl. Ross. II (1844–1846) 647, quo ad pl. taur.—*S. campestris* γ . *capitatus* DC. Prodr. VI (1837) 361, quo ad pl. taur.—*S. campestris* Boiss. Fl. or. III, 412 quo ad pl. taur.—**Exs.**: Callier, Iter. taur. tert. (1900) No. 639.

Perennial. Rhizome obliquely ascending or almost horizontal, short, densely covered with slender and long roots. Stem solitary, erect, simple

or somewhat branched in upper part, ribbed, densely white-tomentose, when young, later glabrescent, 15–40 cm high. Basal leaves ovate or oblong, gradually narrowed into petiole as long as lamina or shorter, somewhat broadened; lamina 3–7 cm long and 1–3 cm wide, obtuse, with small teeth or almost entire; cauline leaves oblong or lanceolate or oblong-linear, sessile, subacute. Inflorescence corymbose at apices of stem and branches (if present). Capitula 3–6, on short, but later unequal, elongated peduncles. Involucre broadly campanulate, 5–7 mm long and 10 mm in dia; outer involucral bracts lacking, inner bracts linear-oblong, subacute, with narrow scarious margin, arachnoid-hairy. Ligulate florets about 10, yellow, 8 mm long and 2–3 mm wide. Achenes terete, ribbed, pubescent, about 3 mm long. Flowering end of May to July; fruiting July to August.

Stony slopes, talus, in montane pine forests.—*European Part*: Crimea. Endemic. Described from Babugan-Yaila. Type in Leningrad.

59. *S. amurensis* Schischk. in Addenda, XXV, 885.—*S. pratensis* Maxim. Prim. Fl. Amur. (1859) 166.—*S. pratensis* var. *polycephalus* Rgl. Tent. Fl. Ussur. (1861) 93, non *S. polycephalus* Ldb. (1844–1846).—*S. campestris* auct. Fl. Orient. Extrem.: Maxim. Prim. Fl. Amur. 165: Kom. Fl. Manchzh. III, 628; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1057, non DC.—*Ice*: Kom. and Alis. op. cit. p. 315 (sub *S. campestris**).

758 Perennial. Root adventitious; stems solitary or 2–3, erect, densely white arachnoid-hairy, (10)20–60 cm high. Basal leaves ovate, narrowly ovate, or sometimes lanceolate, obtuse, or subacute, basally narrowed into flattened petiole, on both sides arachnoid-hairy, with very small, blackish, remote teeth, their laminae 1.5–8.0 cm long and 1–5 cm wide; cauline leaves numerous, gradually reduced upward. Lowermost cauline leaves identical with basal ones, short-petiolate, rest sessile, amplexicaul, lanceolate, acute, 4–8 cm long and 1.0–1.5 cm wide; upper leaves lanceolate linear, smaller. Capitula 3–10, in umbellate inflorescence on arachnoid-pubescent peduncles usually many times as long as capitulum, with linear, acute, small, bracteal leaves at base of umbel. Involucre in single whorl, broadly-campanulate, 6–7 mm long and about 10 mm in dia. Ligulate florets about 12, light yellow, oblong, 10 mm long and 2.0–2.5 mm wide, ovary and anthers pubescent. Achenes terete, 2.0–2.5 mm long. Flowering May to July.

Sedge-mixed herb meadows, marshy meadows, mixed and oak forests and edges, sandy meadows, slopes and occasionally in cultivated fields.—*Far East*: Zeya-Bureya, Ussuri. *General distribution*: Northeastern China. Described from vicinity of Blagoveshchensk. Type in Leningrad.

*sampastris here but correctly given below and in index—General Editor.

60. *S. succisifolius* Kom. Fl. Kamch. III (1930) 167.

Perennial. Stem erect, simple, sulcate, violet in lower half, sparsely floccose-hairy, 50–60 cm high. Basal and lower cauline leaves on floccose-hairy petioles longer than lamina (4–10 cm long), withering early, their laminae ovate or narrowly ovate, 3.5–9.0 cm long and 2.5–3.0 cm wide, acute, with fine teeth or entire, cuneately narrowed toward base, glabrous; middle cauline leaves like basal but narrower; upper leaves narrowly lanceolate, smaller. Capitula 3, on short, 4 cm-long, pubescent peduncles in umbellate inflorescence. Involucre in single whorl, about 1 cm in dia; involucre bracts about 20, linear-lanceolate, acuminate, 6–7 mm long, covered with multi-cellular brownish hairs. Ligulate florets pale yellow, about 12, 12 mm long and 3 mm wide. Achenes pubescent, 4 mm long; pappus white. Flowering July to August.

Riverine meadows.—*Far East*: Kamchatka. Endemic. Described from Koryatskaya Creek, a tributary of Avacha River. Type in Leningrad.

Note. Along with *S. succisifolius*, V.L. Komarov recognized the presence of typical *S. campestris* (Retz.) DC. also in Kamchatka but, in my opinion, the latter species is not found at all in Kamchatka and is replaced here by *S. succisifolius* Kom.

759 61. *S. lenensis* Schischk. in Addenda, XXV, 885.

Perennial. Rhizome ascending, 8–10 mm thick, densely covered with numerous slender roots. Stem glabrous or floccose-hairy, uniformly leafy in lower half, almost lacking leaves in upper half, hollow, finely sulcate, 25–50 cm high. Basal leaves with petioles shorter than lamina or slightly longer, lamina ovate or lanceolate-ovate, 4–6 cm long and 1.5–3.0 cm wide, obtuse or acute, with remote, fine, blackish teeth, glabrous or floccose-hairy; lower cauline leaves narrower than basal leaves, usually lanceolate, acuminate or sometimes acute, sessile, very rarely long-petiolate, 4–12 cm long and 0.5–2.0 cm wide, almost linear and small in upper part of stem. Inflorescence umbellate, with 3–7 capitula on peduncles usually of unequal length. Involucre in single whorl, 5–8 mm long and 10–15 mm in dia, sparsely pubescent; involucre bracts lanceolate-linear, with thin, acuminate, blackish apex. Ligulate florets about 12, yellow, sometimes orange yellow, 12 mm long and 3 mm wide. Achenes 2.0–3.5 mm long, pubescent. Flowering July to August.

Meadows, floodplains of rivers, tundra.—*Eastern Siberia*: Lena-Kolyma. Endemic. Described from Yakutian ASSR, the village of Amginskoe. Type in Leningrad.

62. *S. cladobotrys* Ldb. Fl. Ross. II (1845–1846) 644; Boiss. Fl. or. III, 411; Grossh. Fl. Kavk. IV, 148.—*S. cladobotrys* var. *typicus*

Cuf. in Fedde, Repert. LXX, 1, III (1933) 93.—*Cineraria longifolia* MB. Fl. taur.-cauc. I (1808) 315, non Jacq. (1774).—*C. campestris* e. *dentatus* DC. Prodr. VI (1837) 361, ex p.; Hohenack. in Bull. Soc. Nat. Mosc. VI, 62.—*C. campestris* var. *longifolia* Trautv. in Tr. Peterb. Bot. Sada, V, 2 (1878) 471.—*Tephroseris cladobotrys* Griseb. and Schenk in Wiegmann's Arch. XVIII, 1 (1852) 342.—*S. brachychaetus* DC. Prodr. VI (1837) 362. p. min. p.

Perennial. Rhizome short, oblique, with numerous roots. Stem solitary, simple, erect, sparsely arachnoid-hairy, with readily detaching hairs or glabrous, sulcate, hollow, 0.5–1.5 cm thick and 60–160 cm high. Basal leaves withering early lower cauline leaves on expanded petioles almost as long as lamina, their laminae broadly ovate or ovate, cordate, subacute, with coarse, irregular, subacute teeth, 6–12 cm long and 3.5–10.0 cm wide; middle cauline leaves like lower but on shorter petioles; upper cauline leaves lanceolate or linear-lanceolate, long-acuminate, basally narrowed into short petiole. Inflorescence corymbose, dense when young, later lax; capitula numerous (20–60), on usually long, glabrous or weakly arachnoid-hairy peduncles, sometimes with narrowly linear, entire, long-acuminate bracteal leaves. Involucre broadly campanulate, 6–7 mm long and 7–8 mm in dia, arachnoid-hairy or subglabrous; outer involucral bracts absent, inner linear-oblong, subacute or obtuse. Ligulate florets yellow, 12–15(20), oblong, 7–12 mm long and 1.5–2 mm wide. Achenes terete, ribbed, about 4 mm long, pubescent or sometimes subglabrous. Flowering June to July; fruiting August.

Mountain forests, tall-herb meadows.—*Caucasus*: Ciscaucasia, Western Transcaucasia. Endemic. Described from Western Georgia. Type in Leningrad.

63. *S. subfloccosus* Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XV (1953) 402.—*S. brachychaetus* DC. Prodr. VI (1837) 362, ex p. quo ad pl. cauc.; Boiss. Fl. or. III, 411.—Grossh. Oprod. Rast. Kavk. IV, 148, non DC.—*S. cladobotrys* var. *pseudorivularis* Cuf. in Fedde, Repert. LXX, I–III (1933) 94.—*S. campester* var. *brachychaetus* Schmalh. Fl. II (1897) 85.—*S. brachychaetus* var. *xerophilus* Grossh. Fl. Kavk. IV (1934) 148; var. *mesophilus* Grossh. op. cit. 148; var. *longifolius* Grossh. op. cit. 149.—*S. integrifolius* Grossh. op. cit. 149.

Perennial. Rhizome short, with slender fibrous roots. Stem simple, solitary, including leaves floccose-arachnoid-hairy, sulcate, 40–120 cm high. Basal leaves numerous or few, with expanded petioles as long as lamina, shorter, or longer, lamina ovate, obtuse, or sometimes subacute, irregularly finely toothed, with obtuse or acute, broadly deltoid

teeth or almost entire, 3.5–10.0 mm long and 2–5 cm wide; lower cauline leaves identical with basal ones; middle leaves sessile, lanceolate or narrowly lanceolate, obtuse or acute, 3–10 cm long and 1.5–2.0 cm wide; upper leaves also sessile, but smaller. Capitula 12–50 (less often 3–10), aggregated into umbellate inflorescence at apex of stem, on arachnoid-hairy peduncles of unequal length; bracteal leaves 2–10, linear, 1–2 cm long and about 1 mm wide, floccose-hairy or subglabrous at base of inflorescence. Involucre about 8 mm long and almost as much in dia; outer involucre bracts lacking, inner linear, with narrow scarious margin, dorsally weakly arachnoid-hairy. Ligulate florets 12–14, yellow or orange, 12–14 mm long and 1–2 mm wide. Achenes pubescent, terete, finely ribbed, brownish, 3–4 mm long; pappus white, shorter than tubular florets, about 6 mm long at fruiting.

Forest edges, cut-over mountain forests, subalpine and alpine meadows up to 2,500 m, rarely ascending higher.—*Caucasus*: Ciscaucasia, Dagestan, Eastern, Western (rarely), and Southern Transcaucasia. Endemic. Described from vicinity of Bakuriani. Type in Leningrad.

Series 2. Papposi Schischk.—Perennial, subglabrous or weakly pubescent plants; leaves oblong or lanceolate, more often finely toothed or almost entire; ligulate florets about 15.

64. *S. papposus* (Rchb.) Less in Linnaea, VI (1831) 244 p. p.; DC. Prodr. VI, 360; Cuf. in Fedde, Repert. LXX, I–III, 187.—*Cineraria* 761 *papposa* Rchb. Icon. II, Fl. critic. (1824) 13.—*Tephroseris papposa* Schur. Enum. plant. Transsilv. (1866) 344.— *Ic.*: Rchb. op. cit. (1824) t. 124.— *Exs.* Degen, Pl. Banatus exs. a. 1897, sine numero.

Perennial. Rhizome short. Stem sulcate, floccose-arachnoid-hairy, basally subglabrous, scabrous above, 40–130 cm high. Basal leaves long-persistent, with petioles longer or shorter than lamina, lamina ovate or narrowly ovate, less often spatulate, 6–12 cm long and 2.0–3.5 cm wide, with 5 remote teeth, less often coarsely toothed, or both sides arachnoid-hairy (more densely beneath), subacute, gradually narrowed toward base. Inflorescence umbellate, at stem apex; capitula on arachnoid-hairy peduncles of unequal length. Involucre in single whorl, 8–10 mm long and about 15 mm in dia. Involucre bracts dark green, less often purple, loosely arachnoid-hairy. Ligulate florets 15, about 3 cm long and 3 mm wide, yellow. Achenes glabrous, 3.0–3.5 mm long. Flowering June to July.

Mountain meadows.—Upper Dniester (Eastern Carpathians). *General distribution*: mountains of Central Europe. Described from Western Europe. Type in Berlin.

65. *S. kawakamii* Makino in Bot. Mag. Tokyo, XXVI (1912) 291; Cuf. in Fedde, Repert. LXX, I-III (1933) 259.—*Ik.*: Miyabe and Miyake, Fl. Saghal., t. 8 (1915).

Perennial. Rhizome short, erect or ascending, with numerous roots, root collar covered with dark brown petioles of dead leaves. Stem sulcate, simple, floccose-arachnoid-hairy, later sometimes subglabrous, 20–30 cm high. Basal leaves finely arachnoid-hairy, more or less long-petiolate, ovate, ovate-oblong or elliptical, sometimes almost round, mostly obtuse, gradually or abruptly narrowed into petiole, with rather distinct, remote, acute teeth, 2.5–8.0(11.0) cm long and 2.0–3.0(5.5) cm wide, petiole usually shorter than lamina, less often much longer; cauline leaves usually sessile, semiamplexicaul, narrowly ovate, oblong-lanceolate, or linear-oblong, finely toothed or entire, acute, turning distinctly black when dry. Capitula 3–8, at apices of stem, in corymbose-umbellate inflorescence, with linear, bracteal leaves. Involucre in single whorl, broadly campanulate, 7–8 mm long and 12–15 mm in dia; involucre bracts 10–15, linear-lanceolate, indistinctly narrowly scarious along margin, glabrous, dorsally crisped-hairy. Ligulate florets yellow, 12–15, 10–15 mm long and 1.5–3.5 mm wide. Achenes terete, glabrous, ribbed, about 4 mm long. Flowering June to July.

Sony mountain slopes.—*Far East*: Sakhalin (southern). *General distribution*: Japan (Hokkaido, Hondo). Described from southern Sakhalin. Type in Tokyo.

- 762 66. *S. asiaticus* Schischk. and Serg. nom. nov.—*S. praticola* Schischk. and Serg. in Sistem. Zam. Gerb. Tomsk. Univ. 1–2 (1949); Kryl. Fl. Zap. Sib. XI, 2855, non *S. praticola* Rouy, Fl. Franc. VIII (1903) 316, nom. nud.—*S. spathulifolius* v. *praticola* Rouy (1903) l. c. descr.—*S. pratensis* Ldb. Fl. Ross. II, 644, p. min. p.; Turcz. Fl. baic.-dahur. II, 94, non DC.—*S. glabellus* (Turcz.) DC. Prodr. VI (1837) 360, non Poir. (1806).—*S. campestris* δ . *glabratus* DC. L. (1837) 381.—*S. subdentatus* (Bge.) Turcz. var. *glabellus* (Turcz. ex DC.) Cuf. in Fedde, Repert. LXX, I-III (1933) 83.—*Cineraria glabella* Turcz. ex DC. (1837) l. c. in synon.

Perennial. Rhizome short, densely covered with slender roots. Stem solitary, simple, glabrous or weakly arachnoid-hairy, ribbed, solid, 20–40 cm high. Basal leaves long-persistent with expanded petioles as long as lamina or shorter, lamina ovate, 2.0–4.5 cm long and 1–2 cm wide, obtuse, usually narrowed toward base, with short, wide, acute teeth, indistinctly arachnoid-hairy or subglabrous; lower cauline leaves like basal; middle leaves usually lanceolate, acute, sessile, semiamplexicaul, toothed or almost entire; upper leaves linear, acuminate or acute. Capitula 2–12, on weakly arachnoid-hairy peduncles

of variable length or almost equal. Involucre in single whorl, 5–8 mm long and 8–10 mm in dia; involucre bracts linear-lanceolate, acuminate, weakly arachnoid-hairy or subglabrous. Ligulate florets yellow, 12–20, linear, about 8–12 mm long and 2.5–3.5 mm wide. Achenes glabrous, 2.0–2.5 mm long. Flowering June to July.

In steppe valleys of mountain rivers, cut-over larch forests, alpine and subalpine meadows.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, Dauria. *General distribution*: Mongolia? Described from alpine Shebel. Type in Leningrad.

67. **S. sukaczewii** Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 437.

Perennial. Rhizome short. Stem erect, simple, glabrous or weakly arachnoid-floccose, sulcate, hollow, 30–70 cm high. Basal leaves withering early, lanceolate or narrowly ovate, gradually narrowed into petiole as long as lamina, longer, or shorter, lamina 3–8 cm long, 0.5–2.0 cm wide, green above, lighter beneath, subobtusely, entire or with indistinct teeth; lower cauline leaves like basal leaves; middle and upper leaves sessile, semiamplexicaul, shorter and narrower, usually obliquely upright, almost appressed toward stem; uppermost leaves linear. Inflorescence with linear, sometimes almost filiform bracts at base; capitula 5–20. Involucre in single whorl, broadly campanulate, 5 mm long, 8–10 mm in dia. Involucre bracts lanceolate-linear, 763 acuminate, glabrous. Ligulate florets 12–15, light yellow, 5–6 mm long, 1–2 mm wide. Achenes glabrous, ribbed, about 2 mm long; pappus white. Flowering June to July.

Marshy meadows and gravel beds of rivers.—*Eastern Siberia*: Dauria, Lena-Kolyma. Endemic. Described from Shilka River. Type in Leningrad.

68. **S. aquilonaris** Schischk. in Addenda, XXV, 684.

Perennial. Rhizome quite long, 3–8 mm thick, covered with few, lone, slender roots; stems straight or somewhat flexuous, simple, few or solitary, usually violet, sulcate, weakly arachnoid-hairy or subglabrous, 20–30 cm high. Basal leaves with expanded petioles, shorter or longer than lamina, lamina ovate or sometimes oblong, obtuse or subacute, along with few, short, broadly deltoid sharp teeth, less often entire, on both sides glabrous, 2–7 cm long and 1.0–2.5 cm wide; cauline leaves 2–4, sessile, amplexicaul, lanceolate, entire, glabrous, 3–6 cm long and 0.8–1.2 cm wide, smaller above. Capitula 2–5 at apices of stem, on short, densely arachnoid-hairy peduncles, sometimes capitula solitary. Involucre 10–12 mm long and 12–15 mm in dia, in single whorl. Involucre bracts lanceolate-linear, dark purple, densely grayish-arachnoid-tomentose. Ligulate florets 10–12, yellow,

1.5 times as long as involucre, 3–4 mm wide, often lacking. Achenes terete, glabrous, 3.5 mm long; pappus 2–3 times as long as achene. Flowering August.

Riverbanks, scrubs.—*Arctic*: Arctic Siberia; *Far East*: Lena-Kolyma. Endemic. Described from Medvezhei River valley. Type in Leningrad.

69. ***S. igoschinae*** Schischk. in Addenda, XXV, 885.

Perennial. Rhizome very long, horizontal. Stem glabrous, 30–40 cm high. Basal leaves 2–3; lower cauline leaves long-petiolate, petiole 2–3 times as long as lamina, lamina narrowly ovate, 2–5 cm long and 0.7–1.5 cm wide, apically round, cuneately narrowed toward base, glabrous, with small teeth or entire; middle cauline leaves lanceolate, subacute, gradually narrowed into petiole as long as lamina; upper cauline leaves linear, entire. Capitula 5, at apices of stem in umbellate inflorescence. Involucre 5 mm long and about 10 mm in dia, in single whorl; involucre bracts linear, almost glabrous or indistinctly pubescent. Ligulate florets about 15, egg-yellow, twice as long as involucre. Achenes terete, about 4 mm long, glabrous or pubescent. Flowering July.

Mountain tundra, near melting snows, in grassy pine forests at 900–1,500 m.—*European part*: Volga-Kama (Urals). Endemic. Described from Southern Urals, from Belaya River. Type in Leningrad.

764 *Series 3. Alpestres* Schischk.—Perennial, subglabrous plants; leaves ovate, sometimes ovate-cordate, with more or less coarse teeth, long-petiolate. Ligulate florets 12–20. Achenes glabrous.

70. ***S. sichotensis*** Kom. Bot. Mat. Gerb. Glav. Bot. Sada, VI (1926) 15; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1654.

Perennial. Rhizome obliquely ascending, 3 mm thick. Stem solitary, sulcate, glabrous or weakly arachnoid-hairy, simple, 20–50 cm high. Basal leaves numerous, with petioles shorter or almost as long as lamina, lamina ovate, subobtusely, irregularly coarsely toothed, dark green above, lighter beneath, weakly floccose-arachnoid-hairy, 3.0–6.5 cm long and 1.5–3.0 cm wide; lower cauline leaves also petiolate; middle leaves sessile, irregularly toothed, ovate-lanceolate or lanceolate, acute, 3–10 cm long and 0.8–3.0 cm wide; upper leaves lanceolate-linear, with a few teeth. Inflorescence umbellate; peduncles weakly pubescent, 3–6 cm at base, with linear bracteal leaves. Involucre in single whorl, 4–5 mm long, about 5 mm in dia in upper part. Involucre bracts 12–15, dark violet, pubescent attenuate into almost blackish tip. Ligulate florets 10–15, yellow, 10 mm long and 1.5 mm wide. Achenes glabrous, ribbed, about 3 mm long; pappus white. Flowering August.

Herb meadows at 1,800 m.—*Far East*: Ussuri. Endemic. Described from Botcha River valley. Type in Leningrad.

71. *S. veresczaginii* Schischk. and Serg. in Sistem. Zam. Gerb. Tomsk. Univ. I (1944).—Kryl. Fl. Zap. Sib. XI, 2856.—*S. crispa dilatata* Ldb. Fl. Alt. IV (1833) 103.—*S. alpestris* Ldb. Fl. Ross. II, 645 ex parte non DC.

Perennial. Rhizome ascending; stem simple, erect, finely sulcate, basally sometimes reddish-violet, glabrous or with leaves weakly arachnoid-floccose, 20–40 cm high. Basal and lower cauline leaves with petiole almost as long as lamina, lamina ovate or roundish, coarsely toothed, 3–5 cm long and 2.5–4.0 cm wide; middle cauline leaves oblong or oblong-ovate, basally narrowed into short, expanded, semiamplexicaul petiole, 3–6(9) cm long and 1.5–2.5 cm wide, toothed; upper leaves sessile, lanceolate or linear, toothed or entire. Inflorescence corymbose; capitula 2–7 (very rarely solitary), on peduncles with lanceolate-linear, acuminate, small, bracteal leaves at base. Involucre 6 mm long and 7–15 mm in dia, glabrous or somewhat arachnoid-hairy, in a single whorl. Ligulate florets yellow, 12–20. Achenes glabrous; pappus a half or slightly more as long as tubular florets. Flowering July to August.

Rocks and herb slopes in subalpine zone.—*Western Siberia*: Altai. Endemic. Described from Altai. Type in Tomsk.

765 72. *S. rivularis* (Waldst. and Kit.) DC. Prodr. VI (1837) 359; Szafer, Kulcz. Pawl. Rosliny Polskie (1953) 700.—*S. rivularis* (Waldst. and Kit.) DC. var. *typicus* Domin and Podpera, Klič k uplné kvetene rep. Ceskoslovenske, 2 (1928) 651.—*S. crispus* Kittel. Taschenbuch Fl. Deutsch. Ed. 2, II (1844) 588, non Thunb. (1794).—*S. crispatus* DC. Prodr. VI (1837) 359; Fedtsch. and Fler. Fl. Evrop. Ross. 995.—*S. kochii* Ldb. Fl. Ross. II (1844–1846) 643, p. min. p.—*Cineraria crispa* Jacq. Fl. Austr. Icones, II (1774) 48.—*C. rivularis* Waldst. and Kit. Ic. pl. rar. Hung. III (1812) 265.—*Thephroseris crispa* Rchb. Fl. Saxon. (1842) 142.—*Ic.*: Waldst. and Kit. op. cit. tab. 239; Hegi, Ill. Fl. VI, 445.—*Exs.*: Fl. exs. Reipubl. Bohem.-Sloven. No. 379, 380, 955; Fl. Stir. exs. No. 586; Fl. Siles. exs. No. 837, 838, 839; Fl. exs. Bavar. No. 538; Hayek, Fl. Styr. exs. No. 586.

Perennial. Stem erect, branched above, 40–80 cm high, arachnoid-hairy when young, glabrous when old. Basal leaves ovate-cordate, obtuse, with sharp teeth, on long thickened petiole sometimes 2–3 times as long as lamina, lamina subglabrous and dark green above, paler and pubescent beneath, 3–7 cm long and 2–6 cm wide; lower cauline leaves like basal but with shorter petiole; upper leaves sessile, lanceolate or narrowly ovate. Inflorescence umbellate, with 4–15,

somewhat irregular, slightly pubescent rays, with many linear-lanceolate bracteal leaves at base. Involucre about 10 mm long and almost much in dia, in single whorl, weakly pubescent. Ligulate florets linear-oblong, about 20. Achenes glabrous, about 2 mm long. Flowering July to August.

Wet subalpine meadows, turf meadows, scrubs and stony slopes at 600–1,600 m.—*European part*: Upper Dniester. *General distribution*: Balkans. Described from Hungary. Type in Budapest.

Note. *S. subalpinus* Koch is very close to *S. rivularis* (Waldst. and Kit.) DC. in habit, but is easily distinguished by the absence of the outer involucre bracts.

Series 4. Hieraciiformes Schischk.—Plants perennial with ovate or lanceolate leaves on petioles almost as long as lamina and with small remote teeth; achenes glabrous; ligulate florets 10–13, yellow or egg-yellow.

73. *S. hieraciiformis* Kom. in Bot. Mat. Gerb. Gl. Bot. Sada, VI (1926) 16 (*S. hieraciformis*); Kom. and Alis. Opređ. Rast. Dalnevost. Kr. II, 1054.

Perennial. Rhizome 3 mm thick, obliquely ascending. Stem simple, glabrous or weakly arachnoid-hairy, 10–25 cm high. Cauline leaves crowded in lower half of stem with petiole usually shorter than lamina, very rarely as long; lamina ovate or lanceolate, less often broadly ovate, 766
ovate, cuneately narrowed at base, with small remote teeth, 2–7 cm long and 0.8–2.5 cm wide and with short curly hairs (mainly along margin). Capitula 2 or solitary. Involucre 4 mm long and 6 mm in dia; involucre bracts 12, oblong, long-acuminate with recurved blackish apex, glabrous. Ligulate florets yellow, 10–13, 10–18 mm long and 2–4 mm wide. Achenes glabrous, terete, 4 mm long and 1 mm wide, longitudinally ribbed; pappus snow-white. Flowering July.

Riparian rocks and stony slopes.—*Far East*: Ussuri. Endemic. Described from Bocha River valley (Sikhote-Alin). Type in Leningrad.

74. *S. subscaposus* Kom. in Bot. Mat. Gerb. Gl. Bot. Sada, VI (1926) 16.—Kom. and Alis. Opređ. Rast. Dalnevost. Kr. II, 1057.

Perennial. Stem almost leafless, 15–30 cm high. Basal and lower cauline leaves elliptical, ovate, or oblong-ovate, broadly cuneate at base, with petiole as long as lamina or longer; their laminae 2.5–7.0 cm long and 1.5–4.0 cm wide. Capitula 1–8. Involucre about 1 cm in dia; involucre bracts 20–30, linear, acuminate, not densely glandular-hairy, only sometimes almost villous. Ligulate florets about 10, 1.5–1.8 cm long and 2–4 mm wide. Achenes glabrous, 4.5 mm long; pappus white. Flowering July.

Crevices of rocks and in stony herb meadows.—*Far East*: Ussuri. Described from Suchan River from Chernyi Kust Mountain, and from Yalu-Dzyan River. *General distribution*:*

Series 5. *Porphyranthi* Schischk.—Ligulate florets violet-purple or flame-red, 8–15, capitula many, very rarely solitary; achenes most often glabrous; perennials.

75. ***S. porphyranthus*** Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 432.—*S. integrifolius* (L.) Clairv. subsp. *capitatus* (Nym.) Cuf. var. *aurantiacus* Cuf. f. *gmelini* Cuf. in Fedde, Repert. LXX, I–III (1933) 26, quo ad pl. sibir. orient.—*S. aurantiacus* α . *glabratus* Turcz. Fl. baic.-dahur. II (1856) 97.—*S. aurantiacus* β . *flosculus* Turcz. ibid. (1856).

Perennial. Rhizome short, covered with long, slender roots. Stem erect, simple, sulcate, with leaves sparsely arachnoid-hairy, sometimes subglabrous, 25–80 cm wide. Basal leaves long-persistent, abruptly or gradually narrowed into short petiole or petiole as long as lamina; lamina broadly or narrowly ovate, sometimes almost obovate, 2.5–14.0 cm long and 1–6 cm wide, obtuse or round, entire or with few, small, remote teeth; lower cauline leaves like basal, middle leaves sessile, semiamplexicaul, narrower; upper leaves lanceolate-linear, acuminate. 767 Capitula 3–9, on sparsely pubescent peduncles of variable length forming corymbose inflorescence. Involucre 4–5 mm long and 7–8 mm in dia; outer involucre bracts absent; inner bracts lanceolate-linear, usually violet, sparsely pubescent. Ligulate florets purple, broadly linear, 8–10 mm long and 3 mm in dia, 8–15. Achenes terete, finely ribbed, glabrous or with occasional hairs, 2.0–2.5 mm long; pappus silvery-white, shorter than tubular florets. Flowering June to July.

Birch, pine-birch, pine-larch, and spruce forests, also their edges, scrubs, often in peat-marsh meadows.—*Eastern Siberia*: Angara-Sayans, Yenisei, Lena-Kolyma, Dauria. Endemic. Described from Krasnoyarsk Territory (Ermakovsk District). Type in Leningrad.

76. ***S. flammeus*** Turcz. ex DC. Prodr. VI (1837) 362; Ldb. Fl. Ross. II, 647; Turcz. Fl. baic.-dahur. II, 25.—*S. flammeus* var. *typicus* Cuf. in Fedde, Repert. LXX, I–III (1933) 89.—*S. flammeus* var. *glabrifolius* Cuf. Ibid. (1933) 90.—*S. flammeus* f. *glabrescens* Hara in Journ. Jap. bot. X (1934) 437.—*S. flammeus* subsp. *glabrifolius*

*In the original text on p. 766, the end of the description of Series 5 ("very rarely solitary; achenes most often glabrous; perennials.") is repeated here in place of the distribution, which is missing.—General Editor.

Kitamura in Acta Phyt. et Geobot. VI (1937) 169.—*Cineraria flammea* Turcz. ex DC. loc. cit. (1837); Herd. in Bull. Soc. Nat. Mosc. XLI, 415.—*C. ignea* Fisch. ex Herd. ibid. (1867).—*Senecio longeligulatus* Lev. and Van. ex Lev. in Fedde, Repert. VIII (1910) 139.—**lc.**: Gartenfl. XII, tab. 394 (1863); Trans. Russ. Hort. Soc. tab. 120 (1863).—**Exs.**: GRF No. 3281.

Perennial. Rhizome short, densely covered with slender roots; stem simple or somewhat branched in upper part, erect, sulcate, together with leaves and peduncles floccose-arachnoid-hairy, with readily detaching hairs, 26–70 cm high. Basal leaves early-withering; lower cauline leaves with petiole almost as long as lamina and somewhat expanded lamina ovate-lanceolate or lanceolate, acute or obtuse, on both sides arachnoid-floccose, more densely beneath, dark green above, paler beneath, with widely spaced fine or coarse teeth; middle leaves lanceolate or narrowly lanceolate, sessile, acute, 5–12 cm long and 1.5–3.0 cm wide; uppermost leaves lanceolate-linear or linear, acuminate, shorter. Capitula 3–20, at apices of stem and upright branches, aggregated in corymbose inflorescence. Involucre 5–6 mm long and 8–10 mm in dia; outer involucre bracts absent, inner linear, acuminate, glabrous or weakly arachnoid-hairy, dark violet. Ligulate florets 8–15, linear, 15–20 mm long and 1–2 mm wide, flame-red or dark violet. Pappus brownish, distinctly shorter than tubular florets; achenes pubescent, somewhat ribbed, about 2 mm long. Flowering June to July.

768 Wet and mixed herb meadows, scrubs.—*Eastern Siberia*: Dauria, Lena-Kolyma; *Far East*: Zeya-Bureya, Ussuri. *General distribution*: Northeastern China, Korea. ?Japan, Mongolia. Described from vicinity of Nerchinsk. Type in Geneva; cotype in Leningrad.

77. **S. besserianus** Mind. in Ukr. Bot. Zhurn. XIII, 3 (1956) 58.—*S. aurantiacus* β . *flosculosus* Bess. ex DC. Prodr. VI (1837) 362.—*S. campestris* β . *aurantiacus* and β . *capitatus* Schmalh. Fl. Sr. i Yuzhn. Ross. II (1897) 85.—*S. besserianus* f. *radiatus* Mind. op. cit. (1956) 60.—**lc.**: Mind. loc. cit. Fig. 2.

Perennial. Rhizome short; stem simple, erect, sulcate, often with violet striations, weakly arachnoid-hairy or subglabrous, 40–70 cm high. Basal and lower cauline leaves on 1.5–6.0 cm long petioles, their laminae elliptical or oblong-elliptical, 3–5 cm long and 1–3 cm wide, subobtuse, irregularly toothed or sometimes entire, almost glabrous; middle cauline leaves short-petiolate or sessile, lanceolate or oblong, smaller than basal; upper leaves sessile, almost linear. Capitula 3–10, aggregated in umbellate inflorescence. Involucre 6–7 mm long and 10–12 mm in dia, in single whorl, basally arachnoid-hairy; involucre

bracts oblong-linear, 6–8 mm long and 1–2 mm wide. Ligulate florets deep violet. Achenes densely pubescent, 2.5–3.0 mm long; pappus white, 3 times as long as achene. Flowering June to July; fruiting August.

Oak forests and edges.—*European part*: Upper Dniester. Endemic. Described from Pochaev, Ternopol District. Type in Kiev.

78. ***S. capitatus*** (Wahlb.) Steud. Nomencl. bot. II (1841) 559.—*S. aurantiacus* (Hoppe) Less. in Linnaea, IX (1834) 191, non Rchb.—*S. aurantiacus* γ. *tomentosus* and β. *capitatus* DC. Prodr. VI (1837) 362.—*S. aurantiacus* b. *lanatus* Rchb. Ic. Fl. Germ. et Helv. XVI (1854) 44.—*S. integrifolius* (L.) Clairv. subsp. *capitatus* Cuf. in Fedde, Repert. LXX, I–III (1933) 10.—*Cineraria capitata* Wahlb. Flora Carpath. (1814) 271.—*C. alpina* All. Flora pedemont. I (1785) T. XXXVIII, f. 2, non L.—*C. aurantiaca* Hoppe ex Willd. Sp. pl. III (1804) 2081.—*Tephrosieris aurantiaca* Griseb. and Schenk. Iter Hung. (1852).—**Exs.**: Fl. exs. Austro-Hung. No. 3773; Hayek, Fl. Stir. exs. No. 149.

Perennial. Rhizome short. Stem 25–40 cm high, erect, simple, densely white-tomentose. Basal leaves in rosette, ovate or lanceolate, subobtusely, narrowed toward base into very short, flattened petiole or sessile, 2.5–7.0 cm long and 2–3 cm wide, entire or with fine, sometimes very fine teeth, arachnoid-tomentose beneath, subglabrous above; cauline leaves like basal leaves but narrower, gradually becoming narrower in upper part, sessile, 2.0–8.5 cm long and 0.5–2.0 cm wide. Capitula 3–6, on short peduncles in lax heads. Involucre 10 mm long and 15 mm in dia; involucre bracts in single whorl, lanceolate, acute, dark violet. Ligulate florets 10–15, flame-red to dark violet, less often absent. Flowering July to August.

Alpine meadows at 2,100–2,250 m.—*European part*: Upper Dniester (Carpathians). *General distribution*: Tatry. Described from Carpathians. Type in Sweden.

Note. The ligulate florets are often absent, which is observed especially often in plants from the Carpathians. However, according to Woloszczak's data, occasionally a form with ligulate florets is found here. It is impossible to treat the form without ligulate florets as a separate species because the occurrence of ligule-less florets is a common feature of a majority of the species in section *Tephrosieri*.

79. ***S. caucasigenus*** Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 427.—*S. aurantiacus* β. *leiocarpus* Boiss. Fl. or. III (1875) 412.—*S. campester* var. *pyroglossa* Trautv. in Tr. Bot. Sada, V (1877) 445.—*S. aurantiacus* Grossh. Opred. Rast. Kavk. (1949) 467, non DC.—*S. pyroglossus* Grossh. ibid. non Kar. and Kir.

Perennial. Rhizome ascending, densely covered with numerous slender roots. Stem erect, simple, basally covered with fibrous dark brown remnants of dead leaves, densely arachnoid-hairy, finely sulcate, 10–45 cm high. Basal leaves ovate, gradually or abruptly narrowed into expanded petiole shorter or longer than lamina, obtuse or subacute, along with irregular, broadly deltoid, subacute or almost obtuse teeth, usually arachnoid-hairy, 2–7 cm long and 1.5–3.5 cm wide; lower cauline leaves like basal leaves but narrower; middle cauline leaves lanceolate, acute, sessile; upper leaves lanceolate-linear or linear, smaller, acuminate or acute; all cauline leaves more or less appressed toward stem. Capitula at stem apex, 3–7 (9), on peduncles of unequal length, forming corymbose inflorescence, less often capitula solitary. Involucre 6–7 mm long and 8–10 mm in dia; outer involucre bracts absent, inner bracts linear, acuminate, dark violet. Ligulate florets 10–15, 10–20 mm long, violet or flame-red. Achenes usually pubescent, less often glabrous, narrowly oblong, 3.5 mm long. Flowering June to August.

Alpine and subalpine meadows, mountain forests, rocks, occasionally on talus, at 1,300–3,500 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern, Western, and Southern Transcaucasia. Endemic. Described from Tskhra-Tskhro Range. Type in Leningrad.

Note. *S. caucasigenus* Schischk. is widely distributed in the Glavnyi [Main] Caucasian Range in the alpine and subalpine zones and in the mountains of Transcaucasia. In habit, it is similar to *S. pyroglossus* Kar. and Kir., which so far is known only from Dzhungarian Alatau.

Possibly, the nonligulate form, described by Steven from the Glavnyi [Main] Caucasus Range under the name *Cineraria fulva* Stev. 770 loc. cit., belongs to this species, and then, maybe, the plant should be called *S. fulvus* (Stev.) Schischk. and not *S. caucasigenus* Schischk. However, I am not fully convinced of the identity of these [two] species and therefore am retaining the latter name as the name assigned to the specimens with ligulate florets.

80. *S. pyroglossus* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 386; Ldb. Fl. Ross. II, 647.—*S. campestris* var. *pyroglossa* Trautv. in Tr. Peterb. Bot. Sada, V, 2 (1878) 415.—*S. integrifolius* subsp. *capitatus* var. *pyroglossus* Cug. in Fedde, Repert. LXX, I–III (1933) 22.—**Exs.:** Kar. and Kir. No. 1624.

Perennial. Root vertical or ascending, 3–4 mm thick. Stem erect, simple, 15–30 cm high, floccose-arachnoid-hairy. Lower leaves narrowly ovate, narrowed into petiole almost as long as lamina or longer; middle and upper leaves sessile, semiamplexicaul, 4.5–6.0 cm

long and 0.8–1.2 cm wide; all leaves acute, with fine, sharp irregular teeth, floccose-arachnoid-hairy. Capitula at stem apex, 2–5 or (less often) solitary. Involucre 10 mm long and 10–15 mm in dia, floccose. Ligulate florets 12–20, 2.0–2.5 cm long and 2–3 cm wide, flame-red, twice as long as involucre. Achenes glabrous, terete, ribbed, about 3.5 mm long. Flowering July to August.

Alpine zone, alpine meadows, moraines and mountain tundra, at 2,200–3,000 m.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau). Endemic? Described from the upper reaches of Lepsa and Sarkan rivers. Type in Leningrad.

81. ***S. karjaginii*** Sof. in Izv. Akad. Nauk Azerb. SSR, (1957) 89.—*S. primulifolius* Somm. and Lev. in Nuov. Giron. Bot. Ital. ser. 2, II (1895/89); Tr. Peterb. Bot. Sada, XVI, 245; Grossh. Fl. Kavk. IV, 148 non Vell. (1827) nec. Müll. in Hook. (1857).—*S. pyroglossus* var. *macrocephala* Lipsky in Tr. Peterb. Bot. Sada, XIII (1894) 305, cfr. Ibid. XIV (1898) 294.—*S. integrifolius* subsp. *capitatus* var. *pyroglossus* f. *primulifolius* Cuf. in Fedde, Repert. LXX, I–III (1933) 23.—*lc.*: Somm. and Lev. in Tr. Peterb. Bot. Sada, XVI (1900) Plate 23.

Whole plant more or less densely floccose-arachnoid-hairy. Rhizome horizontal, somewhat thick, densely covered with numerous roots. Stem somewhat thick, weakly sulcate, leafy, 5–20 cm high. Basal leaves broadly ovate, narrowed into short or long-winged petiole, their laminas at base cuneate or almost round, sometimes cordate, in young leaves floccose-arachnoid-hairy along margin, later subglabrous, more or less coarsely toothed with obtuse teeth, 3.5–4.0 cm long and about 2.5 cm wide; lower cauline leaves like basal leaves but narrower, oblong-linear, with petiole expanded at base; upper leaves sessile, with semiamplexicaul auricles; uppermost leaves linear. Capitula 1–8, at stem apex, in corymbose inflorescence on thick and arachnoid-hairy peduncles, longer in outer capitula, usually with 1 linear bract. Involucre about 10 mm long and 15 mm in dia, dark purple; outer involucral bracts absent, inner bracts linear-lanceolate, dorsally pubescent, apically glabrous. Ligulate florets 20–25, 9–12 mm long and about 2 mm wide, often orange; tubular florets 13 mm long. Achenes glabrous, 5 mm long and 0.75 mm wide; pappus white, slightly shorter or two-thirds as long as tubular florets. Flowering July to August. (Plate XXV, Fig. 1).

Alpine zone, on talus, moraines, in alpine meadows at 2,300–3,500 m.—*Caucasus*: Ciscaucasia (Glavnii[Main] Range), Dagestan, Eastern Transcaucasia (Southern Osetia). Endemic. Described from Nakhar, Teberdinsk, Kukurtia and Elbrus ranges. Type in Florence; cotype in Leningrad.

Series 6. Frigidi Schischk.—Plants perennial, arachnoid-hairy, sometimes densely tomentose particularly on peduncles below capitulum; ligulate florets yellow or sometimes orange, about 15; capitula often solitary (less often) 3; plants usually 10–20 cm high, rarely up to 30 cm.

82. **S. atropurpureus** (Ldb.) B. Fedtsch. in Fedtsch. and Fler. Evrop. Ross. (1911) 992.—*S. frigidus* Less. in Linnaea, VI (1831) 289; Ldb. Fl. Ross. II, 632, ex p.; Rupr. in Beitr. Pfl. Russ. VII, 28.—*S. frigidus* Less. var. *radiata* and var. *discoidea* Trautv. in Tr. Peterb. Bot. Sada V (1878) 538.—*S. frigidus* Less. var. *radiata* Trautv. Fl. ripar. Kolym. (1878); Tr. Peterb. Bot. Sada, VI, 25.—*S. integrifolius* (L.) Clairv. subsp. *atropurpureus* (Ldb.) Cuf. in Fedde, Repert. LXX, I–III (1943) 43.—*S. uralensis* Gorodk. ex Kryl. Fl. Zap. Sib. XI (1949) 2342.—*Cineraria atropurpurea* Ldb. in Mém. Acad. Sc. Pétersb. V (1815) 574.—*C. frigida* Richards, Bot. Append. to Frankl. narr. of Journ. (1823) 748.—*C. frigida* α. *genuina*, a. *arctica*, b. *taimyrensis*, c. *uralensis* Herd. in Bull. Soc. Nat. Mosc. XL (1867) 439.

Perennial. Rhizome short, horizontal or ascending. Stems solitary or few, erect, 2–10(20) cm high, lanate from base or only in upper part, with dark purple arachnoid hairs, finely sulcate, simple, very rarely with 1–2 short branches. Basal and lower cauline leaves ovate, oblong-ovate or lanceolate, 1–6 cm long and 0.5–2.0 cm wide, sessile or petiolate, petioles almost as long as lamina or slightly longer, subobtuse, narrowed toward base, entire or with remote teeth, arachnoid-hairy or subglabrous; upper leaves lanceolate, sessile, smaller. Capitula usually solitary at stem apex, less often 2–3. Involucre 7–8 mm long and about 10 mm in dia, in a single whorl; involucre bracts lanceolate-linear, acuminate, with dark brown, thin, entangled, multicellular hairs, with narrow scarious margin. Ligulate florets yellow, 12–15, oblong, 772 about 10(15) mm long and 4(6) mm wide. Achenes terete, glabrous or slightly pubescent, about 3 mm long. Flowering July to August. (Plate XXXV, Fig. 2).

Tundra: mossy, patchy, polygonal, cotton-grass-lichen, sedge-lichen; in thickets of low shrubs.—*Arctic*: Arctic Europe, Novaya Zemlya, Arctic Siberia, Chukotka, Anadyr; *Eastern Siberia*: Lena-Kolyma; *Far East*: Okhotsk (mountains), Kamchatka (mountains). *General distribution*: Bering Strait area, Arctic America. Described from Siberia. Type in Leningrad.

Note. Over its wide range, the plant varies in all respects. Sometimes it is very small, 2–4 cm high, sometimes it reaches 20 and even 30 cm (seldom) high; pubescence also varies, which apparently depends partly on age: young plants, just beginning to flower, are



usually strongly pubescent, sometimes almost tomentose (var. *tomentosus* Trautv.); later they become glabrescent (var. *glabratus* Trautv.). The color of the ligulate florets is sometimes light yellow, sometimes dark yellow or even orange (var. *aurantiacus* Trautv.). The ligulate florets sometimes do not develop (var. *flosculosus* Trautv. or var. *discoideus* Trautv.), but are usually well developed (var. *radiatus* Trautv.). The capitula usually are solitary (var. *monocephalus* Trautv.) or two or three. The florets mostly are light yellow, but sometimes reddish-orange (var. *pyroglossus* Trautv.).

83. *S. tichomirovii* Schischk. sp. nov. in Addenda, XXV, 886.

Perennial. Rhizome short, ascending. Stem solitary, erect, thick, 4–6 mm thick, 10–15 cm high, glabrous from base to middle, tomentose-arachnoid-hairy above, with brownish hairs. Basal leaves 4–6, with petioles 2–3 times as long as lamina, lamina narrowly ovate, 3–4 cm long and 0.5–1.5 cm wide, glabrous, light green, subacute, toothed, teeth remote and with callous thickening; cauline leaves like basal but sessile and amplexicaul, glabrous; upper leaves smaller and with stem densely arachnoid-hairy. Capitula at stem apex, solitary. Involucre 1.5 mm long and 2.5 mm in dia; involucre bracts in single whorl, as also part of stem densely lanate tomentose with dark brownish hairs. Ligulate florets 20–25, dark yellow, linear, 1.5–2 times as long as involucre. Achenes not known. Flowering July.

Tundra.—*Arctic*: Chukotka. Endemic. Described from Chukotka. Type in Leningrad.

775 84. *S. pricei* Simps. in Journ. Linn. Soc. XLI (1912–1913) 425.—*S. cryophilus* Schischk. and Serg. in Sistem. Zam. Gerb. Tomsk. Univ. 1–2 (1949); Krylov, Fl. Zap. Sib. XI, 2841.—*S. integrifolius* (L.) Clairv. subsp. *atripurpleus* (Ldb.) Cuf. var. *robustus* Cuf. in Fedde, Repert, LII, I–III (1933) 43.—*Ice*: Simps. op. cit. Pl. 22, fig. 8–12.

Perennial. Rhizome creeping, 2–5 mm thick, with long fibrous root. Stems solitary or few, erect or basally ascending, 6–25 cm high, with leaves arachnoid-hairy or floccose-arachnoid-hairy, glabrous below, lanate-tomentose below capitulum; lower leaves on long expanded petioles (up to 12 mm wide), 2–4 times as long as petiole, lamina ovate or almost round, obtuse, at base sometimes almost cordate, with indistinct obtuse teeth, 1.5–4.0 cm long and almost as wide, glabrous beneath, floccose-tomentose above; middle cauline leaves like basal but smaller and short-petiolate; upper leaves sessile, ovate-lanceolate or lanceolate, acuminate, often arachnoid-woolly. Capitulum solitary, large, including ligulate florets 4–5 cm wide. Involucre arachnoid-woolly; involucre bracts in single whorl, linear, acuminate, sordid violet. Ligulate florets

20–25, yellow, linear-oblong, 12–20 mm long and 3.5–4.5 mm wide. Achenes glabrous, 2.0–2.5 mm long. Flowering July.

Alpine zone, on rubbly tundra, rocks and stony slopes.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans. *General distribution*: Mongolia. Described from Tannu-Ola Range. Type in London.

85. *S. turczaninovii* DC. Prodr. VI (1837) 360.—*Cineraria frigida* Richards. β . *robusta* Herd. α . *atropurpurea* Herd. ex p. α . *eriocephala* Herd. ex p. in Bull. Soc. Nat. Mosc. XL, 2 (1867) 439.—*Senecio integrifolius* (L.) Clairv. ssp. *atropurpureus* (Ldb.) Cuf. var. *taimyrensis* Cuf. in Fedde, Repert. LXX, I–III (1933) 45.—*S. integrifolius* (L.) Clairv. ssp. *atropurpureus* (Ldb.) Cuf. var. *robustus* (Herd.) Cuf. op. cit. (1933) 44.—*S. tundricola* Tolm. in Comt. Rend. Acad. Sci. URSS (1928) 226, p. min. p.—*S. aurantiacus* γ . *tomentosus* Turcz. Fl. baic.-dahur. II (1856) 97.—*S. aurantiacus* δ . *capitatus* Turcz. Ibid. (1856).—*S. frigidus* Turcz. Ibid. (1856) 94, non Less.—*Ic.*: Popov, Fl. Sr. Sib. II, Fig. 88.

Perennial. Rhizome short, densely covered with numerous roots. Stems few, erect, simple, cylindrical, somewhat sulcate: young stems woolly, old glabrous below and glandular-woolly above, mixed with white dark purple hairs, 10–20 cm high. Leaves on both sides subglabrous; basal leaves oblong-ovate, narrowed into petiole shorter than or as long as lamina, entire or toothed; lower cauline leaves oblong-lanceolate or lanceolate, semiamplexicaul, toothed or entire; uppermost leaves sessile, with cordate and amplexicaul base, lanceolate, acuminate, somewhat sinuate. Capitula at stem apex, 2–3, less often solitary. 776 Involucre 10–12 mm long and 15 mm in dia. Tubular florets intensely egg-yellow, anthers dark purple. Ligulate florets about 15, orange-yellow, with dark purple striations, more intensely colored on lower side, sometimes ligulate florets absent (f. *pseudofulvus* Cuf.). Achenes glabrous or with occasional hairs, about 4 mm long; pappus white. Flowering July to August.

Marshy places near treeline, alpine and subalpine meadows, in mountain sedge-hypnum moss tundra up to 3,000 m.—*Eastern Siberia*: Angara-Sayans, Dauria. *General distribution*: Mongolia (mountains in vicinity of Lake Kosogol). Described from Shebel Range. Type in Geneva; cotype in Leningrad.

Note. The plants vary greatly in the color of the ligulate florets—from yellow to orange: in the number of the capitula—1–5, in the degree of pubescence of the plant, and in the height of the stem. The achenes sometimes are glabrous and at times pubescent.

As in the majority of the species of section *Tephroseris*, plants of this species are found with capitula lacking ligulate florets (f. *pseudofulvus* Cuf.).

86. *S. tundricola* Tolm. in Compt. Rend. Acad. Sci. URSS (1928) 266 p. p.; Hultén in Svensk. Vet. Akad. Handl. Ser. 3, VIII, No. 2, 205.—*S. campester* var. *aurantiaca* Trautv. in Tr. Peterb. Bot. Sada, V, 2 (1878) 538.—*S. campester* var. *fulva* Trautv. in Tr. Peterb. Bot. Sada, V, 2 (1878) 539, non *Cineraria fulva* Stev.—*S. kamtschaticus* Kom. Fl. Kamch. III (1930) 166.—*S. integrifolius* ssp. *atropurpureus* var. *robustus* (Herd.) Cuf. Repert. spec. nov. LXX, I–III (1933) 44.

Perennial. Rhizome short, apically covered with blackish-brown remnants of dead leaves. Stem erect, simple, together with leaves densely arachnoid-hairy, 12–40 cm high. Basal leaves 2–4, ovate or oblong, their laminae 1–4 cm long and 1.8–2.0 cm wide, abruptly or gradually narrowed into more or less long, expanded petiole; cauline leaves oblong or lanceolate, sessile, semiamplexicaul, entire or toothed. Capitula 1–5(10), at stem apex. Involucre in a single whorl, broadly campanulate, 7 mm long and 15 mm in dia; involucre bracts oblong-linear, acuminate, greenish, pubescent, apically dark purple. Ligulate florets 12–15, orange, 2 cm long and 3 mm wide. Achenes glabrous or pubescent, 2.5–3.0 mm long; pappus white, slightly shorter than tubular florets. Flowering July to August.

Hummocky and meadow tundra, stony mountain slopes, alpine meadows.—*Arctic*: Arctic Europe (Gydansk tundra, Polar Urals), Arctic Siberia, Anadyr, Chukotka; *Eastern Siberia*: Lena-Kolyma; *Far East*: Okhotsk, Kamchatka, Endemic. Described from Gydansk tundra from the lower reaches of the Yenisei and other rivers. Type in Leningrad.

- 777 87. *S. subfrigidus* Kom. Fl. Kamch. III (1930) 169.—*S. malaisei* Hult. in Svensk. Vet.-Akad. Handl. Ser. 3, VIII, No. 2 (1930) 199.—*lc.*: Hult. Ibid. Pl. 6, fig. a and page 199, fig. 3 (fl.).

Perennial. Rhizome almost horizontal, not thick. Stem erect, sulcate, sparsely pubescent, simple or somewhat branched, 10–20 cm high. Basal and lower cauline leaves long-petiolate, glabrous, their laminae almost spatulate, with a few teeth; upper leaves sessile or subsessile, broadly lanceolate. Capitula solitary or 2–5. Involucre about 1 cm in dia; involucre bracts lanceolate, acute. Ligulate florets about 15–20, yellow, 8–10 mm long. Achenes glabrous, ribbed; pappus after flowering longer than florets. Flowering July to August.

Mountain forests with dwarf pine, on sandy-clayey mountain slopes.—*Arctic*: Anadyr; *Far East*: Okhotsk, Kamchatka. Endemic. Described from vicinity of the village of Tigil. Type in Leningrad.

88. *S. pseudoaurantiacus* Kom. in Fl. Kam. III (1930) 168.—*S. bogdanoviczii* Kom. Ibid. (1930) 170.

Perennial. Rhizome short, oblique, covered with dark brown remnants of dead leaves. Stem sulcate, together with leaves arachnoid-hairy, 20–35 cm high, simple. Basal leaves oblong-obovate, toothed, 3–10 cm long and 2–3 cm wide, narrowed into winged petiole; cauline leaves like basal but sessile, semiamplexicaul, acuminate. Capitula 1–3(5), in corymbose inflorescence; peduncles arachnoid-hairy. Involucre 10 mm long and 15 mm in dia; involucre bracts lanceolate-linear, densely arachnoid-hairy in lower part, glabrous above or puberulent, green or dark purple. Ligulate florets orange-yellow, 1.6–2.5 cm long and 2–3 mm wide. Achenes sparsely pubescent. Flowering July to August.

Grass-mixed herb meadows, mountain tundra, alpine meadows.—*Far East*: Kamchatka, Okhotsk. Endemic. Described from Klyuchevaya Sopka [mud volcano]. Type in Leningrad.

89. *S. sumneviczii* Schischk. and Serg. Sistem. Zam. Gerb. Tomsk. Univ. 1–2 (1949); Kryl. Fl. Zap. Sib. XI, 2856.—*S. aurantiacus* Kryl. Fl. Alt. Tomsk. Gub. III, 679, non DC.—*S. integrifolius* (L.) Clairv. ssp. *atropurpureus* (Ldb.) Cuf. var. *taimyrensis* Cuf. f. *nekrassovii* Cuf. Repert. spec. nov. LXX, I–III (1933) 45.—*Cineraria frigida* Richards. β . *robusta* a. *atropurpurea* Herd. in Bull. Soc. Nat. Mosc. XL (1867) 44, 45.

778 Perennial. Rhizome obliquely ascending, densely covered with slender roots. Stem erect, simple, 12–50 cm high, usually floccose-arachnoid-hairy. Lower leaves ovate, apically round or subobtusely, narrowed into petiole almost as long as lamina, lamina 2–9 cm long and 1.0–3.5 cm wide; middle and upper leaves oblong or ovate-lanceolate, sometimes lanceolate-linear, 3.5–6.0 cm long and 3–10 cm wide, obtuse or acute; all leaves irregularly and finely toothed, weakly arachnoid-hairy. Capitula at stem apex, 2–4 or even solitary, lacking ligulate florets, 10 mm long and 6–10 mm wide. Outer involucre bracts 1–2 or even absent; inner bracts linear, more or less pubescent or subglabrous, often violet. Ligulate florets light or orange-yellow, 2–3 times as long as capitula[sic., recte involucre]. Achenes terete, about 3–4 mm long, ribbed, glabrous or pubescent (mainly on ribs).

Rocks, stony slopes, in alpine zone and occasionally in alpine tundra.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans; *Soviet Central Asia*: Dzhungaria-Tarbagatai (Saur Tarbagatai). Endemic. Described from Altai. Type in Tomsk.

90. *S. reverdattoi* Sobolevsk. Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIV (1951) 50.—*S. fedorovianus* Schischk. ibid. XVI (1954) 435.—*loc.*: Sobolevsk. loc. cit. Fig. 2.

Perennial. Rhizome short, vertical, with long and slender roots, covered with blackish-brown remnants of dead leaves; whole plant arachnoid-hairy. Stem solitary, erect, straight, more or less sulcate, usually violet, 12–30 cm high. Basal leaves clustered into rosette, narrowly ovate or oblong-ovate, gradually narrowed toward base into flattened petiole, obtuse, with fine, remote, violet teeth, lamina 2.0–6.5 cm long, 0.7–2.0 cm wide; other leaves sessile, semiamplexicaul, lanceolate or linear-lanceolate, acute, 6.0–7.5 cm long and 0.4–1.2 cm wide, more or less adpressed to stem; upper leaves smaller and narrower. Capitula 3–6, at stem apex, on arachnoid-hairy peduncles forming umbellate-corymbose inflorescence, with 2–4 linear or almost filiform, violet colored bracteal leaves at base. Involucre 5–8 cm long and almost as much in dia, in single whorl; involucral bracts linear, dark violet, long-acuminate, with scarious border, dorsally sparsely arachnoid-hairy. Ligulate florets 8–10, egg-yellow, 10–12 mm long and 1–2 mm wide or even absent (var. *eligulatus* Theod.); tubular florets with 5 teeth, slightly violet in upper part. Achenes terete, ribbed, glabrous or with occasional hairs, 4 mm long; pappus white, almost as long as florets. Flowering July to August.

Alpine zone in alpine meadows.—*Eastern Siberia*: Angara-Sayans, Lena-Kolyma. Endemic. Described from Tsagan-Shibetau Range. Type in Tomsk; cotype in Leningrad.

Series 7. Jacutici Schischk.—Perennials with woody rhizome; leaves white-tomentose beneath, small, entire; stem 8–10 cm high; ligulate florets 8–10, egg-yellow.

779 91. *S. jacuticus* Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 430.—*lc.*: Schischkin, *ibid.*, p. 431.

Perennial. Plant forming more or less dense tussock; rhizome woody, ascending, 3–4 mm thick, strongly branched in upper part and densely covered with white-tomentose dead leaves and few brownish, dead stems of previous year. Flowering shoots[scapes], 8–10 cm high, simple, violet, finely arachnoid-hairy. Basal leaves numerous, ovate or broadly ovate, usually obtuse, entire, abruptly narrowed into petiole, petioles shorter or slightly longer than lamina, lamina green and weakly arachnoid-hairy above, densely white-tomentose beneath, 1–2 cm long, 0.7–1.3 cm wide; cauline leaves oblong-linear, 1–2 cm long and 1–3 mm wide; acute, arachnoid-hairy. Capitula solitary, at stem apex. Involucre in a single whorl, 10 mm long and as much in dia; involucral bracts lanceolate, acute, glandular-hairy. Ligulate florets 8–10, egg-yellow, with 4 darker veins, about 6 mm long and 4.0–4.5 mm wide. Achenes terete, glabrous; pappus white.

Rubby, scrub-lichen mountain tundra.—*Eastern Siberia*: Lena-Kolyma. Endemic. Described from Aldan highlands. Type in Leningrad.

Section 14. Obejaciae DC. Prodr. VI (1837) 341; Boiss. Fl. or. III, 383; Rouy, Fl. Fr. VIII, 341.—Annuals, less often biennial; cauline leaves more or less divided, auriculate or amplexicaul; ligulate florets absent or slightly, or much longer than florets; involucre with a few outer involucre bracts; florets yellow; achenes usually pubescent, less often glabrous.

Series 1. Vicosi Schischk.—Plants annual, sticky; ligulate florets yellow, slightly longer than involucre, achenes glabrous.

92. **S. viscosus** L. Sp. pl. (1753) 868; Ldb. Fl. Ross. II, 629; Boiss. Fl. or. III, 386; Schmalh. Fl. II, 86; Grossh. Fl. Kavk. IV, 146.—*Jacobaea viscosa* Gilib. Plantae rar. et comm. Lithuaniae (1785) 30; Grossh. Fl. Kavk. IV, 146.— **Ic.**: Syreistsch. Ill. Fl. Mosk. Gub. III, 282; Fedtsch. and Fler. Fl. Evrop. Ross. 992.—Hegi, Ill. Fl. 791, 792; Jav. and Csapody, Iconogr. Fl. Hung. 530 (1933).— **Exs.**: GRF No. 3497a, b; Herb. Fl. ingr. No. 330; Pl. Finl. exs. Nos. 393 and 983.—Fl. Polon. exs. No. 376.

Annual. Whole plant glandular-hairy, with unpleasant odor, sticky. Stem erect, usually branched from base or middle, less often simple, 5–50 cm high. Basal (early-withering) and lower cauline leaves more or less long-petiolate, oblong or ovate, simple pinnate or almost twice pinnate, 1–10 cm long and 0.5–3.0 cm wide, their lobes oblong, irregularly coarsely toothed or, in turn, pinnatifid; upper leaves smaller, lanceolate, toothed, amplexicaul, with large, entire or toothed auricles. Capitula at apices of stem and branches, usually few aggregated in lax corymb, less often solitary. Involucre campanulate, 6–8 mm long and 4–6 mm in dia; outer involucre bracts linear, 1–3(10), a third to a half as long as inner; inner bracts linear, whitish along margin, acuminate and blackish at apex. Ligulate florets yellow, linear, slightly longer than involucre. Achenes terete, glabrous or sparsely pubescent, ribbed, dark violet, about 4 mm long. Flowering July to August; fruiting September.

Coastal and river sands, railroad embankments and near dwellings.—*European part*: Ladoga-Ilmen, Baltic Region, Upper Volga, Volga-Kama, Upper Dniester; *Caucasus*: Cis-caucasia, Eastern and Western Transcaucasia. *General distribution*: Scandinavia, Central Europe, Atlantic Europe, North America (introduced). Described from Europe. Type in London.

93. *S. calvertii* Boiss. Diagn. Ser. II, 3 (1856) 32; Grossh. Fl. Kavk. IV, 146.—*S. viscosus* Boiss. Fl. or. III, 386, ex p.—*B. viscosus* auct. cauc.; Trautv. in Tr. Peterb. Bot. Sada, IV (1877) 152, non L.

Annual. Like previous species but plant often less branched; leaves simple pinnate; capitula somewhat larger; involucre about 10 mm long; peduncles usually longer; achenes sparsely pubescent between ribs with short and stiff hairs. Flowering June to July.

Herb slopes, along stream banks and gravel beds at 1,200–2,100 m.—*Caucasus*: Ciscaucasia, Eastern, Western, (Karchkhal Mountain) and Southern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from vicinity of Zreerum [sic., Erzurum?]. Type in Geneva.

Note. As mentioned above, the plant is difficult to distinguish from *S. viscosus* L. and requires further study.

Series 2. Vulgares Schischk.—Plants annual, with simple hairs, not sticky; ligulate florets absent; achenes pubescent.

94. *S. vulgaris* L. Sp. pl. (1753) 867; Ldb. Fl. Ross. II, 628; Turcz. Fl. baic.-dahur. II, 88; Schmalh. Fl. II, 86; Grossh. Fl. Kavk. IV, 146; Kryl. Fl. Zap. Sib. XI, 2838.—*S. flosculosus* Gilib. Fl. Lithuan. III (1785–1787) 198.—*Jacobaea vulgaris* Claus in Goebel. Reise, II (1838) 283.—**Ис.**: Fedtsch. and Fler. Fl. Evrop. Ross. 990; Syreistsch. Ill. Fl. Mosk. Gub. III, 281; Hegi, Ill. Fl. VI, 2, 7; Javorka and Csapody, Iconogr. Fl. Hung. (1933) tab. 530.—**Exs.**: Herb. Fl. Ingr. No. 323; Fl. Polon. exs. No. 154.

781 Biennial or annual. Whole plant more or less arachnoid-hairy or subglabrous. Stem erect, 12–40(50) cm high. Basal and lower leaves oblong-spatulate, narrowed into short petiole, or petiole almost as long as lamina, toothed, withering early, 2–10 cm long and 0.5–2.5 cm wide; middle cauline leaves oblong or lanceolate, deeply sinuate-pinnately lobed, with irregularly toothed or entire lobes, sometimes leaves only deeply toothed, acute, narrowed toward base, sessile, 3–11 cm long and 0.5–2.0 cm wide. Capitula campanulate, 6–8 mm long and about 5 mm in dia, on often divergent, 1.0–3.5 cm long peduncles. Outer involucral bracts 2–7, lanceolate, often blackish at apex, (1/6) 1/4–1/2 as long as inner bracts. Ligulate florets absent. Achenes pubescent, about 2.5 mm long. Flowering July to August; fruiting August to September.

Near dwellings, kitchen gardens, crops, gardens and parks, railroad embankments, sandy banks of rivers and lakes, forest edges.—*European part*: Karelia-Lapland, Dvina-Pechora, Ladoga-Ilmen, Baltic Region, Upper Dnieper, Upper Volga, Volga-Don, Volga-Kama, Middle

Dnieper, Upper Dniester, Crimea (mainly in vicinity of the Nikita Botanical Garden); *Caucasus*: Ciscaucasia, Western Transcaucasia; *Western Siberia*: Ob River Area, Irtysh, Upper Tobol; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria, Lena-Kolyma (very rarely city of Yakutsk); *Far East*: Ussuri, Uda River Area, Kamchatka, Sakhalin, Kuril Islands (Shimushir Island). *General distribution*: Scandinavia, Central and Atlantic Europe, Mediterranean Region, northern Africa, Asia Minor, Iran, Japan, northeastern China, Korea; introduced into North America. Described from Europe. Type in London.

Economic Importance. The leaves of *S. vulgaris* contain alkaloids, viz., senecionine and senecine, which are known antihemorrhagic substances and are used as an extract and tincture in gynecological practice.

95. *S. dubius* Ldb. Fl. Alt. IV (1833) 112; Ej. Fl. Ross. II, 628; DC. Prodr. VI, 341; Fisch. and Mey. Ind. VII sem. horti Petropol. (1840) 55; Kryl. Fl. Zap. Sib. XI, 2839.—*S. vulgaris* L. var. *dubia* Trautv. in Bull. Soc. Nat. Mosc. XL (1866) 56; Kryl. Fl. Alt. III, 669.—*S. vulgaris* var. *parvula* Trautv. op. cit. (1866) 363.

Annual. Stem erect, sometimes slightly bent, 6–30 cm high, branched, somewhat angular, glabrous or with occasional, rather long, white hairs. Leaves oblong-lanceolate, semiamplexicaul, with remote teeth or pinnatisect, with linear, indistinctly toothed or entire lobes, 2–7 cm long and 3–10 cm wide, less often leaves linear and entire. Inflorescence corymbose paniculate. Capitula on long (3.0–3.5 cm long) peduncles with linear, entire, long-acuminate, bracteal leaves; capitula narrowly campanulate, 6 mm long and 4 mm in dia in upper part. Outer involucre bracts 1–8, lanceolate-linear, acuminate, adpressed to inner bracts, a sixth to a fourth as long as inner bracts lacking black spot at apex; inner bracts often dark at apex. Ligulate florets absent; tubular florets yellow, slightly longer than involucre. Achenes sericeous, ribbed, 3.0–3.5 mm long. Flowering April to June; fruiting June to July. (Plate XXXVI, Fig. 2).

782 Sandy, often damp places, alkaline meadows, salt marshes, gravel beds of rivers, riparian woodlands, river sands, among chee grass.—*European part*: Trans-Volga (reported from Kamyshin); *Western Siberia*: Irtysh; *Eastern Siberia*: Angara-Sayans (Tuva Autonomous Region); *Soviet Central Asia*: Aralo-Caspian Region, Lake Balkhash Region, Syr-Darya, Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai Region. *General distribution*: Sinkiang, Mongolia, Kuldzha, Kashgaria, Kwan Lun, Hansu, Shanghai. Described from northeastern Kazakhstan (Chaganka River). Type in Leningrad.

Note. The plant is highly variable depending on the ecological conditions. Under drought conditions, it barely measures 2–5 cm while under adequately moist conditions, it may be 20 cm high and more. Efforts have been made a number of times to segregate botanical varieties, which, in my opinion, is purposeless.

Series 3. *Sylvatica* Schischk.—Ligulate florets 2–14, slightly longer than involucre or as long; achenes 2–3 mm long, densely pubescent.

96. ***S. sylvaticus*** L. Sp. pl. (1753) 868; Ldb. Fl. Ross. II, 629; Schmalh. Fl. II, str. 86; Grossh. Fl. Kavk. IV, 146; Syreistsch. Fl. Mosk. Gub. III, 282; Fedtsch. and Fler. Fl. Evrop. Ross. 991.—**Exs.:** GRF No. 319; Pl. Polon. exs. No. 377.

Annual. Stem erect, branched, less often simple, sulcate, arachnoid-hairy or pubescent, with simple hairs, sometimes mixed with glandular hairs, 20–70 cm high. Basal leaves withering early; lower cauline leaves short-petiolate; middle and upper leaves sessile or with auriculate expanded amplexicaul base, their laminae ovate or oblong, 4–8 cm long and 1.0–4.5 cm wide, pinnately parted, lobes oblong or oblong-linear, deeply and irregularly pinnate or irregularly toothed with sharp teeth, subglabrous and dark green above, lighter beneath sparsely pubescent mainly along veins. Capitula numerous, at apices of stem and branches; peduncles hairy, shorter than capitulum, forming lax corymbose panicle. Involucre pubescent, 6 mm long and 3–4 mm in dia, in 2 whorls; outer involucral bracts a sixth as long as inner bracts, often with a blackish spot at apex; inner bracts linear, with scarious margin, with a blackish spot at apex. Ligulate florets 8–14, very short and twisted, as long as or longer than involucre, light yellow. Achenes terete, ribbed, densely pubescent, 2–3 mm long; pappus white. Flowering June to August; fruiting September.

Forest edges, pine woods, edges of marshes, sandbars, cut-over areas and burned clearings in forests.—**European part:** Ladoga-Ilmen, Baltic Region, Upper Dnieper, Upper Volga? Volga-Kama, Volga-Don, Upper Dniester; **Cauca-Caucasus:** Western Transcaucasia (in vicinity of Batumi, probably introduced). **General distribution:** Scandinavia, Central Europe, Atlantic Europe, Mediterranean Region, North America (introduced). Described from forests of northern Europe. Type in London.

97. ***S. krascheninnikovii*** Schischk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XV (1953) 410.—***S. pedunculatus*** Edge. in Trans. Linn. Soc. XX (1851) non Sch. Bip. (1844); Boiss. Fl. or. Suppl.

301.—*S. coronopifolius* var. *sphacelatus* O. Hoffm. in Ova Paulsen Olufsen's second Pamir. Exped. (1903) 152.—*S. coronopifolius* auct. non. fl. As. Med. non Desf.

Annual. Stem erect, 8–25 cm high, branched from base or above, sparsely pubescent or subglabrous. Leaves obliquely upright, ovate-oblong, 1.5–3.0 cm long and 0.4–1.5 cm wide, pinnatisect almost up to midrib, with 2–4 pairs of linear, subobtusely lobes, toothed, with few irregular teeth or almost entire, like stem sparsely pubescent. Capitula campanulate, 5–6 mm long and 2.5–4 mm in dia in upper part, on slender peduncles 1–5 cm long, with 2–4, linear, acuminate bracteal leaves, usually numerous and forming lax, corymbose-paniculate or paniculate inflorescence. Outer involucre bracts 1–5, narrowly linear, a sixth to a fourth as long as inner bracts; all involucre bracts glabrous, apically (inner ones) usually with blackish spot (var. *sphacelatus* O. Hoffm.). Ligulate florets 2–7, slightly longer than involucre. Achenes terete, 2.5–3.0 mm long, densely pubescent. Flowering July to August; fruiting August to September. (Plate XXXVI, Fig. 1).

Mountain spruce forests, gravel beds of mountain streams, near rocks, stony slopes, rubbly talus and occasionally in lucerne crops; up to 3,800 m.—*Soviet Central Asia*: Tien Shan, Pamiro-Alai. *General distribution*: Sinkiang, Tibet, Iran Region (Afghanistan), Indo-Himalayas. Described from Dhawla Valley (Himalayas). Type (*S. pedunculatus* Edg.) in London.

Series 4. Vernales Schischk.—Plants more or less densely arachnoid-hairy; biennials, rarely perennials; leaves pinnatifid; achenes densely pubescent.

98. ***S. vernalis*** Waldst. and Kir. Pl. rar. Hung. I (1802) 23; Ldb. Fl. Ross. II, 630; Trautv. in Mélang. biol. II, 129; Boiss. Fl. or. III, 389; Schmalh. Fl. II, 86; Grossh. Fl. Kavk. IV, 147.—*S. squalidus* MB. Fl. taur.-cauc. II, 309, non L.—*S. crassifolius* Sibth. and Sm. Fl. Graeca IX (1837) 53 non Willd.—*S. rapistroides* DC. Prodr. VI (1837) 346.—*S. chrysanthemifolius* Ldb. Fl. Ross. II, 630, non Lam.—*S. peduncularis* Griseb. Spicil. II (1844) 224.—*S. vernalis* α. *genuinus* and β. *pauciflorus* Lindm. Prodr. Fl. cherson. I (1872) II; Fl. cherson. I, 225.—*S. euxinus* Mind. in Ukr. Bot. Zhurn. XIII, 3 (1956) 60.—*Jacobaea squalida* C.A.M. Verzeichn. Pfl. Cauc. (1831) 81.—**lc.**: Waldst. and Kit. op. cit. tab. 24; Sibth. and Sm. op. cit. 868; Hegi, Ill. Fl. VI, 2, 781, 782, 785; Javorka and Csapody, Iconogr. Fl. Hung. (1933) 530.—**Exs.**: GRF Nos. 976, 976a; Fl. Polon. exs. No. 46 and No. 375; Bot. Mus. of University of Tartu, No. 179.

Biennial or annual. Stems solitary or 2–4(6), simple or branched in upper half (sometimes from base), arachnoid-hairy and finely sulcate in young stage, later subglabrous (var. *glabrescens*), 10–40 cm high. Leaves oblong or broadly linear, arachnoid-hairy; basal and lower cauline leaves oblong, more or less long-petiolate, withering early, sinuate-lobate, their lobes horizontal, irregularly toothed with remote and sharp teeth; other leaves sessile, with toothed, amplexicaul, auricles, oblong-linear, pinnately divided, with oblong sharply toothed, 2–8 cm long and 0.5–2.5 cm wide lobes. Capitula at apices of stem and branches in corymbose inflorescence. Involucre 7 mm long and almost as much in dia; inner involucre bracts linear, acuminate and with a black spot at apex; outer bracts a sixth as long as inner bracts, narrowly linear, with blackish spot at apex. Ligulate florets linear-oblong, yellow or light yellow, less often almost white, 12–16, 1.5–2 times as long as involucre, 2 mm wide. Achenes terete, pubescent, 2–3 mm long. Flowering May to July.

Sandy meadows, stony and calcareous slopes, logged areas, scrubs, railroad embankments, field borders.—*European part*: Ladoga-Ilmen, Baltic Region, Upper Volga, Upper Dnieper, Middle Dnieper, Volga-Kama (western), Volga-Don, Bessarabia, Lower Volga, Upper Dniester, Crimea; *Caucasus*: All regions; *Soviet Central Asia*: Syr-Darya (?introduced), mountainous Turkmenia; *General distribution*: Scandinavia, Central Europe, Balkans-Asia Minor, Mediterranean Region, northern Africa. Described from Balkans. Type in Vienna.

Note 1. I did not think it possible to recognize the species *B. euxinus* Mind., recently split off by Minderova from *S. vernalis* Waldst. and Kir. of southern Ukraine. The differences cited by the author between the new species and *S. vernalis*, namely, a not very tall stem, more branching, smaller leaves and capitula, and the absence of a blackish spot on the involucre bracts, are hardly convincing and apparently result from ecological conditions. On the basis of the last character, De Candolle split off a separate species from *S. vernalis* from the vicinity of Baku under the name *S. rapistroides* DC. Examination of much material shows that the appearance or absence of blackish spot is not a reliable character, and it is hardly possible to consider both *S. rapistroides* DC. and *S. euxinus* Mind. as a separate species. For some reason *S. rapistroides* DC. is not mentioned at all in the work of Minderova.

Note 2. Trautvetter (loc. cit.) reports that the plant becomes strongly branched with age, and then the pubescence on the stem and branches disappears.

99. *S. sosnovskiyi* Sof. in Izv. Akad. Nauk Azerb. SSR, 1 (1957) 89.—*S. vernalis* β. *caucasicus* DC. Prodr. VI (1837) 345; Ldb. Fl.

Ross. II, 630.—*S. vernalis* γ . *nanus* Boiss. Fl. or. III (1875) 389, non *S. nanus* Sch. Bip. (1847).—*S. glacialis* Marcov. in Tr. Yurevsk. Bot. Sada, IV (1903) 239; Grossh. Fl. Kavk. IV, 146, non *S. glacialis* Sch. Bip. (1845) and Wedd. (1855–1857).—*S. candolleanus* Sosn. in Zhurn. Russk. Bot. Obshch. XIV, 1 (1929) 86; Kolak. Fl. Abkh. IV, 248; Mandenova, in Fl. Gruzii, VIII, 395; Grossh. Opred. Rast. Kavk. 466, non Hook. and Arn. (1841).—*S. vernalis* var. *leiocarpa* Trautv. in Tr. Peterb. Bot. Sada, X, 1 (1887) 116.

Biennial or annual. Root slender. Stem solitary or few, with leaves arachnoid-hairy or glabrous, simple or branched, sulcate, 5–25 cm high. Basal leaves withering early, with petioles as long as lamina, lamina ovate or oblong, more or less toothed, 10–20 mm long and 3–7 mm wide; cauline leaves larger, lower ones narrowed into short petiole, upper ones sessile, semiamplexicaul, 1–6 cm long and 3–10 mm wide, irregularly toothed, or shallow-pinnately divided, obtuse or acute; uppermost leaves small, linear, acuminate. Capitula at apices of stem and branches, 2–6, often forming corymbose inflorescence. Involucre 6–7 mm long and almost as much in dia; outer involucre bracts linear, about 10, a fourth to a third as long as inner ones; inner bracts linear-lanceolate, dorsally keeled, acuminate and, like outer involucre bracts, with a dark spot at their apices. Ligulate florets yellow or sometimes pinkish-violet, ovate-oblong, 7–8 mm long and 3–5 mm wide. Achenes terete, weakly ribbed, pubescent (sometimes glabrous), 2.5–3.0 mm long. Pappus almost as long as tubular florets. Flowering July. (Plate XXXVI, Fig. 2).

Moraines, talus, edges of glaciers, alpine meadows, at 1,800–3,700 m.—*Caucasus*: Ciscaucasia, Dagestan, Eastern, Western and Southern Transcaucasia (Mongokhlyu-Tapa). Endemic. Described from Glavnyi [Main] Caucasian Range. Type in Geneva.

100. ***S. polycephalus*** Ldb. Fl. Ross. II (1844–1846) 630, non Clarke (1872); B. Schischkin in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI, 438.—*S. vernalis* auct. fl. cauc. ex parte.

Annual. Stem ascending at base, erect above, strongly branched from middle, sulcate, with leaves sparsely arachnoid-hairy, 20–30 cm high. Basal leaves withering early; cauline leaves sessile, oblong, 1.0–3.5 cm long and 0.5–1.0 cm wide, upright, often deflexed downward, pinnately cut up to midrib, their lobes linear-oblong, cartilaginously thickened along margins, irregularly toothed with deltoid, sharp teeth; uppermost leaves oblong or linear, almost entire. Capitula at apices of stem and branches, numerous. Involucre 5 mm long and almost as much in dia, glabrous or sparsely pubescent; outer involucre bracts narrowly linear, a third to a half as long as inner ones; inner bracts

linear-lanceolate, with narrow scarious margin, acute; all bracts without blackish spot at their apices, less often with an inconspicuous spot.
 786 Ligulate florets about 12, yellow, ovate-oblong, 4.0–4.5 mm long and 2 mm wide. Achenes terete, weakly ribbed, densely pubescent, 3 mm long; pappus as long as tubular florets. Flowering June to July.

Southern slopes in scrubs.—*Caucasus*: Eastern and Southern Transcaucasia (Zangezur). Endemic. Described from vicinity of Tbilisi. Type in Leningrad.

Note. Ledebour in *Fl. Ross.* (loc. cit.) gives a brief but quite accurate description of the species on the basis of Wilhelms's specimens collected from the vicinity of Tbilisi. Wilhelms's collection was repeated by Lipsky, but Lipsky's specimens remained unidentified. Boissier saw Wilhelm's specimens and determined them as a variety of *Senecio vernalis* but did not assign any name to the variety. I think it is necessary to consider this plant as the separate species *S. polycephalus* Ldb. All specimens collected were without roots, but, as was supposed by Ledebour, it apparently is a perennial plant.

Series 5. Subdentati Schischk.—Plants subglabrous, annual, 10–20 mm high, with pinnately divided or toothed, often entire leaves; achenes densely short-pubescent.

101. **S. subdentatus** Ldb. *Fl. Alt.* IV (1833) 110, non Turcz. (1837) nec *Cineraria subdentata* Bge. *Enum. pl. Chin. boreal.* (1832) 39.—*S. subdentata* α. *ramosus* Ldb. β. *simplex* Ldb. γ. *parvulus* Ldb. *Ic. pl. Fl. Ross.* V (1834) tab. 493, f. 7, f. 2, f. 3.—*S. coronopifolius* Desf. var. *subdentatus* Boiss. *Fl. III* (1875) 890.—*S. subdentatus* Ldb. var. *fasciculatus* Litw. in *Spisok Rast. Gerb. Russk. Fl. VI* (1908) No. 1876.—*S. alabugensis* Winkl. in *Tr. Bot. Sada, XI* (1890) 320.—*Ic.*: Ldb. *Ic. pl. Fl. Ross.* V (1834) tab. 493, f. 1, f. 2, f. 3.—**Exs.**: GRF No. 1876, 3496.

Annual. Stem branched from base or middle, including leaves glabrous, 5–25 cm high. Leaves broadly linear or oblong. 2.5–5.0 cm long and about 2–10 mm wide, subobtuse, toothed, sometimes almost entire, sessile, semiamplexicaui, with occasional hairs or glabrous; upper leaves smaller; bracteal leaves linear, glabrous or sometimes ciliate. Inflorescence corymbose-paniculate, lax; capitula upright, on long (1.5–4.0 cm) peduncles. Involucre 6 mm long and 6 mm in dia in upper part; outer involucral bracts few, linear or entirely lacking; inner bracts oblong-linear, with scarious margin. Ligulate florets 1.5–2 times as long as involucre. Achenes terete, densely pubescent, 3–5 mm long; pappus white, 5–6 mm long. Flowering May to June.

Wormwood, sandy, and clayey steppes on dry and stony slopes, in crops of common millet, wheat, and others, ascending mountains to 2,800 m.—*Caucasus*: Western Transcaucasia; *Siberia*: Altai, Irtysh; *Soviet Central Asia*: Lake Balkhash Region, Syr-Darya, Amu-Darya, Aralo-Caspian Region, Kara-Kum, Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai, mountainous Turkmenia. *General distribution*: Mongolia, Dzhungaria-Kashgaria. Described from Altai. Type in Leningrad.

787 **Note.** Cufodontis (loc. cit.) thinks that the name *S. subdentatus* Ldb. cannot be retained for this plant because, in his opinion, it must be assigned to a species of section *Tephroseris* on the basis of the following considerations. In 1832, Bunge described a Chinese plant from section *Tephroseris* under the name *Cineraria subdentata* which in 1837 was transferred by Turczaninow (*Bull. Soc. Nat. Mosc.*, X, No. 7, 1837, 154) to the genus *Senecio*—*S. subdentatus* (Bge.) Turcz. But Turczaninow overlooked the fact that, in 1833, Ledebour had already described another plant under the name *S. subdentatus* Ldb. and that this epithet must be retained for that plant, while the Chinese perennial plant *S. subdentatus* from section *Tephroseris* should be assigned another name. That name is *S. pierotii* Miquel. in *Ann. Mus. Bot. Ludg.-Batav*, II (1886) 182 (cf.: Kitagawa, *Lin.* p. 470).

102. **S. noëanus** Rupr. in *Bull. Phys.-Math. Acad. Pétersb.* XIV (1856) 231.—*S. salsugionosus* Schischk. in *Spisok Rast. Gerb. Fl. SSSR*, XI (1949) 164.—*S. subdentatus* var. *pinnatipartitus* Bge. *Reliq. Lehmann.* (1851) 172; Trautvetter in *Tr. Peterb. Bot. Sada*, I, 274.—*S. coronopifolius* var. *pinnatipartita* Trautv. in *Tr. Peterb. Bot. Sada*, V (1877) 444.—*S. coronopifolius* auct. *Fl. As. Med. non Desf.*—**Exs.:** GRF No. 3496.

Annual. Stem branched from base or almost simple, weakly arachnoid-hairy or crisped-hairy, 10–20 cm high. Leaves pinnately parted, broadly ovate or oblong, 2.0–3.5 cm long and 1–2 cm wide, deeply lobed but not to midrib, like stem weakly arachnoid-hairy or subglabrous, lobes lanceolate-linear, 1.0–1.5 cm long and 1.0–2.5 mm wide, acute or obtuse, entire or with few teeth, sessile, semiamplexicaul, basally expanded like auricles or somewhat sagittate. Inflorescence lax corymbose; peduncles 0.7–4.0 cm long, with few, small, entire bracteal leaves. Capitula broadly campanulate. Involucre 5–6 mm long and, 5 mm in dia in upper part; inner involucre bracts linear; outer bracts 5–8, linear, acuminate, a sixth to a fourth as long as inner bracts, glabrous. Ligulate florets 6–8, yellow, 1.5 times as long as involucre. Achenes finely pubescent, terete, about 2 mm long. Flowering May.

Salt marshes and alkaline meadows.—*European part*: Lower Volga; *Caucasus*: Ciscaucasia, Eastern, Western and Southern Transcaucasia,

Talysh; *Soviet Central Asia*: Aralo-Caspian Region, Kyzyl-Kum. *General distribution*: Iran, Asia Minor. Described from vicinity of Kotto. Type in Leningrad.

Note. In many works on the Flora of Soviet Central Asia, this plant is called *S. coronopifolius* Desf. The latter was described from North Africa. It is very close to *S. noëanus* Rupr., but differs by having larger capitula, smaller achenes, and somewhat fleshy leaves. From Africa *S. coronopifolius* Desf. was introduced to Sicily by ships (see: A. Fiori, A. Beguinot, R. Pampanini. *Flora Italica exsiccata*, No. 674).

788 The following names are unexplained and doubtful, and also erroneously reported for the USSR.

1. *Senecio triangularis* Hooker, Fl. bor. Am. I (1833) tab. 115; Ldb. Fl. Ross. II, 642.—An American plant reported by Ledebour from Sitka Island.

2. *S. lugens* Richard. in Bot. App. Frankl. Journ. ex. 2 (1823) 747; Ldb. Fl. Ross. II, 644.—An American arctic plant unknown in the USSR.

3. *S. gmelini* Ldb. Fl. Ross. II (1844–1846) 645.—Apparently, this plant does not belong to the genus *Senecio* L., as was noted also by Ledebour.

4. *S. aquaticus* Hill. Veg. syst. II (1771) 120.—A western European plant mistakenly reported by Ledebour from Kiev and the Far East.

5. *S. rupestris* Waldst. and Kit. Pl. rar. Hung. II (1805) 436; Ldb. Fl. Ross. II, 635.—Mistakenly reported by Ledebour from the mouth of the Volga River and Western Georgia.

6. *S. chrysanthemifolium* Poir. Encycl. meth. VII (1806) 96; Ldb. Fl. Ross. II, 630.—Mistakenly reported by Ledebour from the southern European part of the USSR, Crimea and the Caucasus.

7. *S. kochii* α. *schkurii* Ldb. op. cit. (1844–1846) 644.—Reported by Ledebour from vicinity of Orenburg.

GENUS 1564. *Ligularia* Cass. Nom. Cons.^{1, 2}

Cass. in Bull. Soc. Philom. (1816) 198, non Duval (1809).—*Senecillis* Gaertn. De fruct. et sem. II (1791) 453, tab. 173.—*Erythrochaete* Sieb. and Zucc. in Abh. Akad. Münch. IV, (1846) 188.—*Senecio* sect. *Ligularia* Benth. in Benth. and Hook. f. Gen. pl. II (1873) 449 (excl. *Farfugium*).—*Hopaea* Reinchb. in Flora, VII (1824) 254,

¹Treatment by A.I. Pojarkova.

²From the Latin *ligula*—tongue.



non Willd. (1801).—*Cyathocephalum* Nakai in Bot. Mag. Tokyo, XXIX (1915) 11.

Capitula heterogamous; outer florets ligulate, in a single whorl, fertile, sometimes with staminodes; disk florets tubular, with regular, 5 toothed, campanulate or tubular-campanulate corolla. Involucre tubular, campanulate or goblet shaped, mostly with 1–3(5) small narrow [supplementary] bracts at base. Involucral bracts 5-many, in 2 distinct or indistinct whorls, but always dimorphic; inner bracts broader, with wide scarious margin; outer bracts narrower, without or with very narrow scarious margin. Anthers with very short, acuminate or obtuse
791 basal appendage; apices of stamen filaments (more probably sterile lower part of connective) thickened and broadened forming so-called antheropodia. Style branches slender, with a small conical or inside flattened apical appendage, acute or roundish at apex, hairy on outer side throughout or only in upper part, sometimes forming only a groove at base of appendage, inside of style branches always glabrous, stigmatic surface occupying entire inside of style branches or rarely as 2 raised, wide, lateral stripes. Pappus of long, white, sordid white, brownish, reddish-brown, or reddish, soft or stiff hairs, with very short barbs, less often pappus hairs rather short (0.5–2.0 mm long) and then acicular-toothed. Achenes always glabrous, finely ribbed-barbate. Common receptacle glabrous, flat or weakly convex, finely alveolate. Perennial herbs, usually with short thick rhizome, densely covered with fibers of thick adventitious roots, less often with slender creeping rhizome and slender adventitious roots. Leaves alternate, contorted in bud, mostly cordate, reniform, ovate or ovate-oblong, less often oblong, mostly sinuate-toothed, less often entire. Capitula of different size (small to large), in racemose or corymbose, simple or compound inflorescences, less often capitula solitary. Florets yellow.

Type of genus: *L. sibirica* (L.) Cass.

The genus consists of more than 150 species distributed mainly in the temperate regions of Eastern and Central Asia. A few species grow in the Middle East, the Caucasus, and Europe.

Economic Importance. Almost all species of the genus *Ligularia* are ornamental plants.

- | | | |
|----|---|----|
| 1. | Involucral bracts free | 2. |
| + | Involucral bracts fused into 3–4-toothed cup | |
| | 34. <i>L. schmidtii</i> (Maxim.) Maxim. | |
| 2. | Pappus hairs very short, 0.5–2.0 mm long, a tenth to a fourth as long as tubular floret, acicular toothed | 3. |
| + | Pappus hairs 4.5–10.0 mm long, not more than a half as long as tubular florets, scabrous | 4. |

3. Leaves always entire 31. **H. glauca** (L.) O. Hoffm.
 + All or at least basal leaves sinuate-toothed
 32. **L. carpatica** (Schott. Nym. and Kotschy) Pojark.
4. Pappus snow-white 5.
 + Pappus brownish or reddish-brown 24.
5. Rhizome creeping, slender, with slender adventitious roots; capitula large, solitary or 2–3(6); involucre cupulate, of numerous involucre bracts; leaves reniform; plants of the Caucasus (subgenus *Dolichorrhiza*) 6.
- 792 + Rhizome short, thick, with dense clusters of cord-like, fleshy, adventitious roots 8.
6. Stem leafless; capitula usually solitary
 38. **L. correvoniana** (Alb.) Pojark.
 + Stem leafy; capitula 1–3(6) 7.
7. Cauline leaves 2, thin when dry, papery; peduncle below capitula covered with thickish hairs; involucre of (7)9–14 flat (lacking thick ribs on back) involucre bracts
 36. **L. renifolia** (C.A.M.) DC.
 + Cauline leaves (2)3–6, crowded; peduncle below capitula tomentose-floccose; involucre of 18–22 bracts, dorsally with thick ribs in lower part 37. **L. caucasica** (MB.) C. Don.
8. Stem at base with several large, nonleafy, membranous bulging sheaths; leaves oblong-elliptical, gradually narrowed into petiole, not thick and not fleshy; capitula 1–3, with goblet-shaped involucre, 1–2 cm in dia 35. **L. pavlovii** (Lipsch.) Cretz.
 + Nonleafy membranous sheaths lacking at base of stem 9.
9. Inflorescence simple raceme (sometimes only lower-most peduncles bearing 2–3(4) capitula), or capitula 1–3 10.
 + Inflorescence compound, oblong-cylindrical, cylindrical-pyramidal, or broadly corymbose panicle; capitula small, with 5–8(12) involucre bracts 18.
10. Leaves glaucous, somewhat thickish, fleshy or more or less coriaceous, stiff, ovate to oblong; inflorescence dense, often spicate raceme 11.
 + Leaves green, not fleshy, soft, cordate, sagittate or reniform; inflorescence more or less lax raceme 12.
11. Involucre always more or less pubescent dorsally; leaves often covered with short, few-celled hairs, but often toothed
 29. **L. alpigena** Pojark.
 + Involucre always glabrous; leaves always entirely glabrous and entire 30. **L. altaica** DC.
12. Short, 6–14 cm high, alpine plant; basal leaves small, 1.5–3.5(4.5) cm long, round; capitula 1(2), large, with bowl-shaped involucre
 12. **L. schischkinii** Rubtz.

- + Plants taller and with larger leaves; if not tall (14–40 cm high), then leaves elongate, oblong-cordate, or sagittate 13.
- 13. Very large plant, up to 2 m high; basal leaves up to 37 cm long and 40 cm wide; capitula large, aggregated in narrow, long (18–50 cm) raceme 20. **L. jaluensis** Rom.
- + Plants much shorter; leaves much smaller; shorter and broader, capitula often in almost corymbose racemes 14.
- 14. Leaves elongated, oblong-cordate or sagittate; involucre narrow, campanulate; capitula (1)3–6(10), aggregated in lax raceme 23. **L. knorringiana** Poljak.
- + Leaves roundish-cordate or reniform; involucre wider, goblet-shaped 15.
- 15. Capitula large, including ligulate florets (5.0)6.5–7.5 cm wide, solitary or 2–5, on remote, stiff peduncles 8–16 cm long 15. **L. robusta** (Ldb.) DC.
- + Capitula smaller, (1)3–10(14), aggregated in dense or lax, sometimes more or less corymbose raceme (sometimes with lower peduncles bearing 2–4 capitula); peduncles soft 16.
- 16. Leaves reniform, strongly broadened; hairs erect and very lax, tomentose-arachnoid-hairy; corolla tube of tubular florets 2/5 as long as limb 18. **L. karataviensis** (Lipsch.) Poljak.
- + Leaves roundish ovate-cordate; pubescence more dense, floccose, appressed tomentum; corolla tube of tubular florets 1/2–2/3 as long as limb 17.
- 17. Capitula (1)3–4(6), aggregated at stem apex on short peduncles 1–5 cm long 16. **L. kareliniana** Stschegl.
- + Capitula 4–10, aggregated in lax raceme; middle and lower peduncles up to 8–10 cm long 17. **L. narynensis** (Winkl.) O. and B. Fedtsch.
- 18. Inflorescence compound, narrow, dense, cylindrical or cylindrical-pyramidal panicle, with short lateral branches; leaves glaucescent, thick and succulent, oblong 19.
- + Inflorescence lax panicles, with more or less long lateral branches; leaves not glaucous and with one exception (*L. altissima*) neither thick nor succulent 21.
- 19. Involucre campanulate or bowl-shaped, involucre bracts 8–12, (8)9–12 mm long; capitula with (5)6–8 ligulate and 12–20 tubular florets 28. **L. talassica** Pojark.
- + Involucre narrower, tubular or tubular-campanulate; involucre bracts 3.5–8.0(9.0) mm long; florets in capitulum fewer, ligulate florets 1–5, tubular florets 4–14(16) 28.
- 20. General inflorescence oblong-cylindrical, in upper part a narrow, dense, spicate, oblong raceme or panicle, usually considerably longer

- than lower part; lower part with remotely branched peduncles bearing racemose or paniculate inflorescence; involucre tubular-campanulate, with 6–8 involucre bracts; ligulate florets (3)4–5; tubular florets (7)10–14(16) 27. **L. heterophylla** Rupr.
- + General inflorescence more or less pyramidal, upper part shorter, broader, usually ovoid; much shorter than lower branched part; involucre narrowly tubular or obconical, with 5–6(8) involucre bracts; capitula with 1–3 ligulate and 4–7 tubular florets 26. **L. macrophylla** (Ldb.) DC.
21. Basal leaves broad, roundish-cordate or deltoid, often expanded 22.
- + Basal leaves elongate, oblong-ovate, or sagittate 23.
22. General inflorescence pyramidal panicle with numerous branches bearing cylindrical or pyramidal individual inflorescences in upper part; involucre tubular-campanulate, green; basal leaves broadly cordate, light green, somewhat thick and succulent, glabrous or sometimes weakly arachnoid-hairy beneath in younger leaves 25. **L. altissima** Pojark.
- + General inflorescence corymbose-panicle, with lateral branches bearing at their apices corymbose inflorescences; involucre narrow, tubular-cylindrical, quickly turning golden-brown; basal leaves dark green above, soft, roundish-ovate-deltoid or broadened, at least young leaves tomentose beneath 24. **L. thomsonii** (Clarke) Pojark.
23. Inflorescence with (30)60–300 capitula, elongated, often a more or less corymbose raceme, with long branches, bearing capitula in raceme or panicle; involucre very narrow, narrowly cylindrical 22. **L. songarica** (Fisch.) Ling.
- + Inflorescence with (10)12–60 capitula aggregated in narrow raceme with short branches bearing (1)4(5) capitula; involucre broader, campanulate or almost goblet-shaped 21. **L. thyrsoides** (Ldb.) DC.
- 24(4). Capitula aggregated in oblong, simple, dense raceme; involucre narrow, cylindrical or campanulate 27.
- + Capitula 1–2 or more, usually aggregated in lax, broad, corymbose, sometimes elongated raceme; involucre wide, goblet-shaped-campanulate or goblet-shaped 25.
25. Involucre bracts densely covered with thickish, dark brown hairs 25.
- 795 + Involucre bracts lacking dark brown hairs 1. **L. hodgsonii** Hook.
26. Capitula (2)3–11, more or less in corymbose raceme; involucre bowl-shaped-campanulate, 10–12 mm long and 0–12 mm in dia;

- basal leaves reniform or roundish-reniform, usually broadened, with palmate venation 2. **L. trichocephala** Pojark.
- + Capitula usually 1–2, less often 3–4; involucre goblet-shaped, 12–14 mm long and 13–18 mm in dia; basal leaves usually ovate-sagittate or roundish-cordate, elongated or more or less as long as wide, with pinnate venation 3. **L. calthifolia** Maxim.
27. Leaves fleshy and succulent, light glaucous, ovate or oblong, with keeled [thickened] truncate or weakly sinuate base; pappus hairs stiff, setaceous 33. **L. mongolica** (Turcz.) DC.
- + Leaves neither fleshy nor succulent, with deeply sinuate, cordate or sagittate base; pappus hairs soft, not setaceous 28.
28. Pappus shorter than tubular florets, as long as corolla tube or very slightly longer (series *Speciosae*) 29.
- + Pappus as long as tubular floret or very slightly shorter 31.
29. All bracteal leaves broad, ovate; involucre bracts glabrous on back or with occasional appressed hairs; stem glabrous from base to inflorescence or weakly arachnoid-hairy 5. **L. splendens** (Levl. and Vaniot) Nakai.
- + Only lower bracteal leaves broad, ovate or ovate-lanceolate, others linear, narrow (1–2 mm wide); involucre bracts pubescent on back with erect, brown, curly hairs; stem and leaves beneath more or less densely covered with similar hairs 30.
30. Only 2–5 lowermost bracteal leaves ovate or lanceolate, rest very narrow, linear; involucre bracts 6–10 mm long; ligulate florets with 4–5(7) veins, tubular florets 9–10 mm long 6. **L. sachalinensis** Nakai
- + Bracteal leaves in lower half of inflorescence broad; involucre bracts 10–13(14) mm long; ligulate florets with 7–10 veins, tubular florets 11–12 mm long 4. **L. fischeri** (Ldb.) Turcz.
31. Plants small, not more than 70–75 cm high, with slender stem and rather thin (0.5–2.0 mm thick), mostly very long, petioles of bracteal leaves; lamina of bracteal leaves small, 1.5–8.0(10.0) cm long, less often solitary, somewhat larger, with strongly developed lobes at base, often sagittate; inflorescence small, with (1)3–15 capitula (series *Longipedes*) 32.
- 796 + Plants large, with thick stem; basal leaves large, up to 25 cm long, with thicker (to 7–10 mm) petioles; inflorescence with numerous capitula, much longer (series *Racemosae*) 34.
32. Basal leaves usually elongate, sagittate or triangular-sagittate, with long (often as long as remaining part of lamina) and usually acuminate lobes at base, petiole 2.5–5 times as long as lamina; inflorescence with (1)2–15 capitula, usually with 1–2(3) sessile

scale leaves below resembling bracteal leaves, but lacking peduncles in their axils; ligulate florets with very short oblong ligule (11–15 mm long and 3–4 mm wide); tubular florets with rather broad, campanulate limb, as long as tube 12. **L. longipes** Pojark.

+ Basal leaves mostly broadly deltoid-cordate, cordate-sagittate or cordate 33.

33. Basal leaves toothed, broad or sometimes only as small, cartilaginous mucro, their petioles mostly 1.5–2(3) times as long as lamina; ligulate florets very narrow (linear or oblong); tubular florets with broadly campanulate limb as long as corolla tube; scale leaves below inflorescence usually absent, rarely one 13. **L. arctica** Pojark.

+ Basal leaves sharply toothed to serrate, mostly with sagittate base and long basal lobes at base, narrowed downward and usually acuminate, their petiole 2.5–4 times as long as lamina; ligulate florets wider; tubular florets with narrowly campanulate limb, much shorter than corolla tube; scale leaves below inflorescence usually 1–3 14. **L. bucovinensis** Nakai

34. Leaves glabrous beneath or hairy only on veins, less often sparsely hairy throughout 35.

+ Leaves somewhat densely or densely pubescent to tomentose beneath 36.

35. Leaves (in herbarium) thin, up to 24 cm long and 22 cm wide; inflorescence up to 32 cm long, with many, usually 30–80 capitula; ligulate florets 7–8(11); tubular florets (18)23–32 with narrow, tubular-campanulate, limb 1.5 times as long as tube 7. **L. sibirica** (L.) Cass.

+ Leaves thick, almost coriaceous, up to 11 cm long and as wide; inflorescence 3–12 cm long, with (1–3)5–10 capitula; ligulate florets 4–7; tubular florets up to 20, with campanulate limb, as long as tube 10. **L. sichotensis** Pojark.

797 36. Plants up to 130 cm high, stem 3–10 cm thick; leaves in herbarium thin, basal leaves 22 cm wide, mostly expanded deltoid-cordate and deltoid reniform, with deeply cordate or hastate base and strongly divergent lobes at base, somewhat densely or densely pubescent beneath, soft, grayish-tomentose; inflorescence 6–32 cm long, with 10–36 capitula; involucre cylindrical-campanulate 6. **L. lydiae** Minder.

+ Plants not as large stem up to 70 cm or up to 90 cm high and 3.5–8.0 mm thick; basal leaves with erect, brownish hairs (not soft-tomentose) and smaller, up to 15 cm wide; inflorescence with fewer capitula 37.

37. All bracteal leaves (at base of peduncles) broadly ovate; ligule of ligulate florets obovate or oblong, with (5)7–10 veins; limb of tu-

- bular florets 1.5–1.75 times as long as tube; scale leaves below inflorescence 1–3, like bracteal leaves but lacking peduncles in their axils; basal leaves broad, mostly roundish-cordate deltoid-cordate, or cordate-reniform, 6.5–12.0 cm long and 7–10 cm wide, usually densely hairy beneath, less often somewhat densely hairy with brownish hairs 9. **L. abakanica** Pojark.
- + Bracteal leaves lanceolate; ligule of ligulate florets linear-oblong and oblong-elliptical, with 4–5 veins; limb of tubular florets as long as tube or somewhat longer, (1)3–6 scale leaves below inflorescence; basal leaves narrower, up to 1.5(2) times as long as wide, 5–18(24) cm long and 4.5–15.0 cm wide, mostly cordate or cordate-sagittate less often deltoid-sagittate, somewhat densely or sparsely pubescent beneath with brownish hairs 11. **L. subsagittata** Pojark.

Subgenus 1. Ligularia.—*Senecio* (sect.) *Ligularia* Benth. in Benth. and Hook. f. Gen. pl. II (1876) 449.—*Senecio* B. *Eu-ligularia* Fr. in Bull. Soc. bot. Fr. 39 (1892) 284.—*Ligularia* O. Hoffm. in Pflanzenfam. IV, 5 (1894) 301 p. p. (excl. *Farfugium*).—*Ligularis* sect. *Cyathocephalum* (Nakai) Kitam. Compos. Japan. (1942) 185; *Ligularis* sect. *Senecillis* (Gaertn.) Kitam. ibid. *Ligularia* sect. *Euligularia* Kitam. ibid.—Rhizome short, thick; densely covered with fibers of filiform adventitious roots. Capitula small, medium or large; involucre with 5 or more involucre bracts, usually free but sometimes (subsection *Stereochaete*, series *Schmidtianae*) fused into cup, with 3–4 teeth in upper part, style branches narrowed toward tip or with conical, or flat short appendage, more or less acuminate or obtuse; stigma surface usually occupying entire inner side of style branches, less often as 2 lateral raised stripes; antheropodia somewhat thicker than filament; 798 pappus mostly of long (more or less as long as achene), soft or stiff scabrous hairs or (subsection *Senecillis*) much shorter than achene.

Section 1. Corymbosae (Fr.) Hand.-Mazz. in Bot. Journ. 69 (1939) 107 p. p.—*Senecio* groupe *Ligularia* B. *Eu-ligularia* 3. *Corymbosi* Fr. in Bull. Soc. bot. Fr. 39 (1892) 290.—*Erythrochaeta* Sieb. and Zucc. in Abh. Akad. Münch. IV, 3 (1846) 188.—*Ligularia* sect. *Euligularia* series *Corymbosae* Kitam. Compos. Japan. III (1942) 197.—Capitula large or medium, aggregated in broad, mostly corymbose raceme, sometimes 1–3; peduncles sometimes lacking bracteal leaves at base or mostly arising from axils of large sessile scale leaves, at least lower of these leaves keeled, enclosing peduncles and often involucre as well; involucre broadly campanulate or goblet-shaped with (5)8–12 involucre bracts; pappus reddish-brown or reddish, nearly as long as tubular florets; antheropodia somewhat thicker than filament; style

branches long, slender, apically attenuate, with stigma surface occupying entire inner side.

Lectotype of section: *L. calthifolia* Maxim.

Species of eastern and southeastern Asia.

Our species of this section constitute the phylogenetic series *Calthifoliae* Pojark., characterized by the presence of large bracteal leaves at the base of the peduncles as well as at the base of the involucre.

One other series of geographical races from Western and Central China, described as varieties of *L. hodgsonii* and *L. yesoensis*, should be referred here.

1. *L. hodgsonii* Hook. in Curtis Bot. Mag. XX (1863) subtab. 5417; Koidz. in Bot. Mag. Tokyo, XXIV (1910) 264 p. p. (excl. synonym.); Kitam. Compos. Japon. III (1942) 197 p. p. (excl. var. *sachalinensis*).—*L. clivorum* Maxim. in Mélang. biol. VII (1870) 555 p. p. (quoad pl. e Hakodate).—*Senecio yesoensis* Fr. in Bull. Soc. bot. Fr. 39 (1892) 306.—*L. hodgsonii* var. *calthaefolia* Koidz. op. cit. (excl. synonym.).—*L. calthaefolia* auct. non Maxim. (1870): Matsum. Ind., pl. Japon. II, 2 (1912) 656; 1857; Vorobiev in Tr. Dalnevost. Fil. Akad. Nauk SSSR, Ser. Bot. III (V) (1956) 76.—*Senecillis hodgsonii* Kitam. in Acta Phyt. Geobot. VIII (1939) 82.—*lc.*: Hook. loc. cit. tab. 5417.

Perennial. Plant with short, thick, fleshy rhizome covered with numerous fibers of thick cord-like roots, but with stiff fibrous remnants of dead leaves in upper part. Stem 25–100 cm high and 2–10 mm thick, succulent, sulcate, purple below, entirely glabrous or pubescent above with coarse, brown and white arachnoid hairs. Leaves bright green, lighter beneath, on both sides glabrous, glaucous; basal leaves 2–3, fleshy, not winged but with semiamplexicaul sheath only at base, petioles glabrous, 1.5–4 times as long as lamina, lamina 6–27 cm long and 8–35 cm wide, reniform, broadly notched at base or cordate-roundish, with deep and narrow notch, and obtuse lobes at base, usually obtuse, sometimes abruptly attenuated into acute apex, with sharp and often irregular teeth, usually with well developed palmate or pinnate venation; caulines leaves 1–3(4), ones from lower part of stem of same shape as basal but most often smaller and with shorter and thin petiole expanded into long sheath, upper leaf (or leaves) with small or almost reduced, deeply toothed lamina and short-winged petiole, greater part of petiole enlarged in sheath. Inflorescence 2.5–13.0(26.0) cm long, elongate or often corymbose raceme, with (4)5–10(15) capitula; peduncles at anthesis slender, soft, later thickened, covered with somewhat thick brownish hairs, upper ones 6–25 2.5(4) cm long, lower up to 5–8 cm, at fruiting up to 14 cm long, all peduncles white-arachnoid-hairy and with large, broad, keeled and glabrous bracteal

leaves at base, enclosing peduncle, arachnoid-hairy and toothed along margin, attenuate at apex; lower bracteal leaves 3.5–5.0 cm long, upper 2–3 cm, often longer than corresponding peduncles. Involucre at base densely arachnoid-hairy, bowl-shaped, 8–16 mm long and at flowering 10–18(20) mm in dia in middle, with 2 apical bracteal leaves at base longer than it, broad, keeled or sometimes narrow to lanceolate; involucre bracts 5–12, always lacking dark thick hairs, glabrous or weakly arachnoid-hairy, sometimes purple; inner bracts broadly ovate or oblong-ovate, with wide scarious border; outer bracts lanceolate to almost linear, with or without narrowly scarious margin; all involucre bracts acuminate and arachnoid-hairy at tip. Capitula including ligulate florets 4–7 cm in dia; ligulate florets 7–14, ligule oblong, 15–25 mm long, 3–6 mm wide, with 6–10 veins, tube 5–7 mm long, sometimes filiform staminodes present. Tubular florets numerous, 8–11 mm long, with narrowly campanulate limb 4.5–6.0 mm long, gradually narrowed into 3.5–5.5 mm-long tube; basal appendage of anthers very short, subobtusate; style branches narrowed toward apex and obtuse, outside approximately up to middle covered with flattened hairs. Pappus pale chestnut-colored, at fruiting reddish-chestnut colored, distinctly shorter than corolla; achenes 6–8 mm long, with almost as long pappus. Flowering July to first half of August; fruiting September.

Herb meadows, open birch groves, herb and stony slopes of mountains up to 700 m.—*Far East*: Sakhalin (south Kuril Islands). *General distribution*: Japan. Described from Hakodate on Hokkaido Island. Type in Kew.

- 800 2. ***L. trichocephala*** Pojark. sp. nova in Addenda, XXV, 886.—*L. hodgsonii* var. *sachalinensis* Naki in Bot. Mag. Tokyo, XXIV (1910) 264; Kitam. Compos. Japon. III, 198.

Perennial. Differs from the previous species by having peduncles and involucre bracts that are always densely covered with thickish, dark brown hairs. The capitula are usually smaller and the involucre bracts usually 10–15 mm long and 10–17 mm wide.

Wet mixed-herb meadows, birch grooves.—*Far East*: Sakhalin (southern part of Sakhalin and Moneron islands). Endemic. Described from vicinity of Yuzhno-Sakhalinsk. Type in Leningrad.

3. ***L. calthifolia*** Maxim. in Bull. Acad. Sc. Pétersb. XV (1871) 374 in Mélang. biol. VII, 4–5 (1870) 554; Kom. Fl. Manchzh. III, 696; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1053.—*Senecio calthaeifolius* Maxim. in Mélang. biol. VIII, 1–2 (1870) 14; Franch. in Bull. Soc. Bot. Fr. 39, 306.

Perennial. Rhizome short, thick, with dense clusters of slender, cord-like roots, covered with somewhat stiff fibrous remnants of dead petioles in upper part. Stem erect, strong, 30–80 cm high and 2.5–5.0 cm thick, white-arachnoid-hairy only in upper part (like peduncles with involucre), and also covered, often very densely, with short, erect, dark hairs, entirely glabrous below. Leaves dry, light green above, much paler beneath, on both sides glabrous or with occasional, short, dark hairs on veins beneath and with thin, pinnately divergent, quite distinct secondary veins; basal leaves 3–6, with long (2–4 times as long as lamina), thin, glabrous, petioles with sheath-like expanded base, lamina cordate-ovate or cordate-roundish, 8–16 cm long and 6–12 cm wide, usually strongly reduced (2–3 cm long and up to 7 cm wide), cordate-reniform only in outermost leaves, with obtuse lobes at base and obtuse or short, acuminate, evenly or unevenly crenate, toothed with sharp, remote teeth; cauline leaves usually 2(1), lower like basal leaves; but much smaller and with shorter petiole; upper, sometimes both leaves, with small, deltoid-hastate lamina and very short, broadly winged, amplexicaul petiole. Capitula 1–2, less often 3–4, including ligulate florets 5.5–7.0 cm in dia, aggregated at stem apex in corymbs, lower capitula on long, up to 7–9 cm, slender peduncles, with large bracteal leaf at base; bracteal leaves up to 3–4 cm long, sessile, carinate, enclosing peduncle and involucre, lanceolate to ovate in unfolded form, thin, acuminate, white-arachnoid-hairy and sometimes with short, dark hairs, upper of them usually longer than peduncles. Involucre broadly campanulate or bowl-shaped, 12–13 mm long, 13–18 mm in dia, in middle at flowering with 2 large (mostly slightly longer than involucre), wide, entirely folded bracteal leaves at base; involucre bracts (5–6) 8–12, leafy, more or less densely white-arachnoid-hairy; inner bracts covered with somewhat thick, dark brown hairs, oblong-ovate or broadly lanceolate with wide scarious margin; outer bracts lanceolate or lanceolate-linear, with narrow scarious margin on both or on one side. Ligulate florets with 20–30 mm long and 4–6 mm wide, ligule with 8–12 veins, tube 7–9 mm long, tubular florets 12–13 mm long, with narrow, campanulate-tubular limb and narrow tube approximately as long; stamens with very thin and short basal appendages of anthers and narrow antheropodia; style branches slender and long, contorted, attenuate, with long hairs on outer side up to middle and below. Pappus light brownish-white, later darker, reddish-brown; mature achenes unknown. Flowering July. (Plate XXXVII, Fig. 1).

Dry, herb and stony slopes, from seacoasts to alpine bald zone (up to 1,600 m).—*Far East*: Ussuri (only southern part of Sikhote-Alin Mountains). Endemic. Described from coast of Olga Bay. Lectotype in Leningrad.

Section 2. Ligularia.—Hoppea Reichenb. in Flora, VII (1824) 254.—*Senecio* groupe *Ligularia* B. *Eu-ligularia* I. *Racemosi* Fr. in Bull. Soc. bot. Fr. 39 (1892) 289 p. p.—*Ligularia* II. *Racemosae* Hand.-Mazz. in Bot. Jahrb. 69 (1939) 117 p. p.—*Ligularia* sect. *Euligularia* series *Racemosae* Kitam. Compos. Japon. III (1942) 190.

Capitula aggregated in simple oblong raceme (sometimes lower peduncles bearing 2–3 capitula); peduncles arising from axils of rather large scaly leaves, of which at least lower leaves carinately folded, enclosing peduncle and involucre; pappus of brownish or reddish-brown less often white hairs, as long as tubular floret or its narrow tube; antheropodia somewhat or distinctly thicker than stamen filament; style branches with acute or obtuse apical appendages; stigma surface occupying entire inner side. Capitula medium-sized, with narrowly cylindrical or campanulate involucre.

Type of section: *L. sibirica* (L.) Cass.

The species of this section are distributed in southeastern, eastern, and northern Asia, the Caucasus and Europe.

Series 1. Speciosae Poljak.—Pappus distinctly shorter than tubular floret or slightly longer than its tube; leaves usually serrate; achenes blackish.

802 Besides the species distributed within our boundaries, a few, still undescribed races from China should be referred here.

4. ***L. fischeri*** (Ldb.) Turcz. Catal. pl. baic. (1838) 11; Kitag. Lineam. fl. Manch. 457 (excl. f.).—*Cineraria fischeri* Ldb. Ind. sem. hort. Dorpat. (1820) 17.—*Cineraria maxima* Turcz. in sched.—*Cineraria speciosa* Schrad. ex Link. Enum. pl. hort. Berol. II (1822) 334.—*Hoppea speciosa* Reichenb. in Flora, VII (1824) 245.—*L. sibirica speciosa* DC. Prodr. VI (1837) 315; Ldb. Fl. Ross. II, 620; Korsh. in Tr. SPb. Bot. Sada, XII, 357.—*L. speciosa* Fisch. and Mey. Ind. sem. hort. Petrop. V (1838) 38; Turcz. Fl. baic.-dahur. II, 84; Maxim. Prim. fl. amur. 164; Kom. Fl. Manchzh. III, 693, p. max. p.; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1053 p. p.; Ling in Contrib. Inst. Bot. nation. Acad. Peip. II (1934) 535 p. p. (quoad pl. prov. Kirin).—*Senecio cacaliaefolius* auct. non Sch. Bip. (1845); Maxim. in Mélange. biol. VIII (1872) 14, p. min. p. (quoad synonym. *L. speciosa*).—*Senecio cacaliaefolius* δ . *speciosa* Franch. in Bull. Soc. bot. Fr. 39 (1892) 296 p. p. (quoad pl. dahur. amur.).—*Senecillis fischeri* Kitam. in Acta Phyt. Geobot. VIII (1939) 82.

Perennial. Rhizome short, thick, glabrous, densely covered with fibrous cord-like adventitious roots and with fibrous remnants of dead leaves in upper part. Stem (30)50–150 cm high, sulcate, like petiole

covered with entangled, yellowish but later turning brownish, multicellular, crisped hairs. Basal leaves with slender, long, petiole, up to 2.5–3 times as long as lamina, with lamina 13–22 cm long and 22–30 cm wide, cordate or cordate-reniform, sometimes almost hastate, obtuse or short-acuminate, with broad or rather deeply lobed base, with short, roundish or rather long, narrow, divergent basal lobes; cauline leaves 2–4, lowermost like basal, but with shorter petiole; next 1–2 leaves smaller, usually acuminate, with short, broadly winged, amplexicaul petiole; upper leaf small, ovate or lanceolate, sessile, with amplexicaul base. Capitula 5–45, aggregated usually in dense or sometimes lax simple raceme, less often lower peduncles branched, bearing 2–4 capitula; peduncles initially straight, upward spreading, later arcuately deflexed, 5–30 mm long, lower ones sometimes up to 6, less often, particularly when branched, up to 10–12 cm long, densely covered with thick, multi-cellular, crisped hairs; bracteal leaves in lower part of raceme large, ovate or ovate-lanceolate, long-acuminate, toothed, often carinate, enclosing peduncle or capitulum, lowermost 3–5 cm long, next smaller, as long as capitulum, with tubular florets, upper ones narrow, lanceolate-linear, entire, all with pubescence like on peduncles and often also with sparse, white, arachnoid hairs. Capitula, including ligulate florets, (2.5) 3–4 mm in dia and with tubular florets exerted from involucre over entire limb. Involucre with 2–3 filiform-linear bracts at base, as long as involucre or shorter, tubular-campanulate, later bowl-shaped; involucre bracts 7–12 dimorphic, 10–13(14) mm long, broader short-acuminate, with wide scarious border, narrower long-acuminate and with narrow scarious border, back and apex of involucre bracts densely covered with brownish, thick, crisped hairs. Ligulate florets (5)6–9, with bright yellow, oblong or oblong-obovate, 7–10-veined ligule, 15–25 mm long and 2.5–5.5 mm wide, and tube 6.0–7.5 mm long, often with filiform staminodes or few with abortive anthers; tubular florets 18–35, with corolla (10)11–12(13) mm long, limb oblong-campanulate, 4–5 mm long, with narrow deltoid, 1.5–2.0 mm long teeth; corolla tube somewhat longer, 5–6(6.5) mm long; stamen tube considerably exerted from corolla; anthers with narrow, acute, apical appendages and very short, acute, basal appendages, filaments with rather broad antheropodia; style branches long, slender, narrowed toward tip, on outside up to base covered with thick short hairs. Pappus brownish, somewhat longer than corolla tube; achenes immature (probably, they do not mature) blackish-brown, narrowly terete, 6–9 mm long, ribbed; pappus slightly longer than achene. Flowering June to July.

Wet meadows, scrub thickets and cut-over mixed, deciduous, and rarely larch forests on moist soil.—*Eastern Siberia*: Angara-Sayans

(vicinity of Irkutsk and the village of Cheremkhovo, Irkutsk Region); Dauria; *Far East*: Zeya-Bureya, Uda River area, Ussuri (only along Amur and Ussuri rivers, in south up to Lake Khanka. *General distribution*: Mongolia (northeastern part), China (northeastern part). Described from cultivated specimen. Type not preserved.

5. ***L. splendens*** (Lévl. and Vaniot) Nakai in Bull. Nat. Sc. Mus. 31 (1952) 117.—*Senecio cacaliaefolius* auct. non Sch. Bip. (1845); Maxim. in Mélang. biol. VIII (1872) 14 p. p. quoad pl. e Kiusiu et excl. synom.—*Senecio cacaliaefolius* var. *speciosa* Franch. in Bull. Soc. bot. Fr. 39 (1892) 296, p. min. p. (quoad pl. jap.).—*L. sibirica* auct. non Cass. (1823): Matsum. and Koidz. in Bot. Mag. Tokyo, XXIV (1910) 149 (excl. syn.); Koidz. in Bot. Mag. Tokyo, XXIV, 265 (quoad aream Japon. et excl. syn. et var.).—*L. speciosa* auct. non Fisch. and Mey. (1838): Kom. Fl. Manchzh. III (1907) 693 p. p.; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1053 p. p.—*Senecio splendens* Lévl. and Vaniot in Fedde, Repert. sp. nov. VIII (1910) 139.—*L. sibirica* var. *fallax* Nakai, Reg. veg. ins. Quelp. (1914) 90.—*L. sibirica* var. *araneosa* Nakai in Bot. Mag. Tokyo, XXXI (1917) 117, non DC. (1837) nec Kom. (1907).—*L. fischeri* auct. non Turcz. (1838); Koidz. Fl. symb. orient.-asiat. 88 p. p. (quoad pl. ex Yezo); Kitam. Compos. Japon. III, 193 p. p. (quoad pl. Korean. japon. et excl. synon.); Nakai in Bull. Nat. Sc. Mus. 31, 117; Hara, Enum. Spermatoph. Japon. II, 227 p. p. (quoad pl. japon. et excl. synon. praeter Lévl. and Vaniot and Nakai).—*L. sibirica* ssp. *fischeri* Kitam. op. cit. (1942) 194, in synom.

Perennial. Rhizome as in two previous species. Stem 50–250 cm high and up to 12 mm thick, ribbed-sulcate, glabrous from beginning or more or less densely arachnoid-hairy, less often, particularly below capitulum, covered with short brown hairs. Leaves bright green and glabrous above, lighter beneath, glabrous or more or less densely arachnoid-hairy, less often sparsely, pubescent with occasional brownish hairs; basal leaves 2, less often 3, with petioles 1.5–2 or more times as long as lamina, hairy like stem or glabrous, slender, basally forming narrow sheath, lamina 10–30 cm long, 12–40 cm wide, roundish-reniform or cordate, usually obtuse, with recurved, roundish, usually short lobes at base, sinuate-toothed or sinuate-serrate; cauline leaves 2–4, mostly 3, lower 1–2 leaves near base, like basal leaves but on shorter petiole, next leaf much above, with small reniform or deltoid, expanded lamina, broadly winged petiole modified into swollen sheath, sometimes one more small, sessile, elongated leaf above, identical to bracteal leaves. Inflorescence of (15)20–75 capitula, aggregated in simple, 10–75 cm-long raceme; peduncles 3–12 mm long, lower ones up to 3–5 cm, thick, arachnoid-hairy and sometimes also with very

short, brown, thickish hairs; all bracteal leaves broad, ovate, sessile, sometimes lower ones pushed to lower part of peduncle, carinately folded and enclosing peduncle and involucre, sometimes slightly longer than involucre, glabrous or arachnoid-hairy, toothed or upper ones entire. Capitula, including ligulate florets, 3–4 mm in dia, erect, later only slightly deflexed. Involucre tubular-campanulate, later bowl-shaped, with 2–3 narrowly linear bracts at base, as long as involucre or much shorter; involucre bracts 8–9, in 2 whorls not distinct; inner bracts broad- to oblong-elliptical, short- or long-acuminate, with wide scarious border; outer bracts almost linear, usually long-acuminate, with narrow scarious margin, enclosed in longitudinal axis formed by spine and margin of neighboring involucre bract, all bracts glabrous on back, only at apex tomentose-floccose and with very small, brown, thickish hairs. Ligulate florets 6–8, with 7–10-veined ligule 15–24 mm long and (3.5)4.5 mm wide, and 7–9 mm long-tube; staminodes observed rarely; tubular florets 22–30, with corolla (12.5)13.5–16.0 mm long, their limbs campanulate or tubular-campanulate, 6.5–7.5 mm long with narrowly deltoid, 1.5–2.0 mm-long teeth, tube (5)6–8 mm long, stamens and styles like previous species. Pappus as long as corolla tube or reaching up to middle of limb, reddish-brown; achenes immature, 7–9 mm long, very narrow, linear. Flowering second half of July to August.

Wet meadows and scrubs on marshy soil.—*Far East*: Ussuri (only in extreme southwest in Posjet District along Suifun and on Russkoe and Popov (Rynda) islands). *General distribution*: China (entire Korea and Quelpart Island and, apparently, part of northeastern part of China bordering Korea), Japan (Hokkaido, Honshu, Kyushu islands). Described from Hallaisan on Quelpart (Cheju) Island. Type in France.

6. *L. sachalinensis* Nakai in Journ. Jap. Bot. XX (1944) 137.—*L. sibirica* var. *speciosa* auct. non DC. (1837) Koidz. in Bot. Mag. Tokyo, XXIV (1910) 265 (excl. synonym.).—*L. speciosa* auct. non Fisch. and Mey. (1838): Miyabe and Miyake, Fl. Saghal. (1915) 270; Kom. Fl. Manchzh. III, 694 p. p.; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1053 p. p.; Sugaw. Ill. fl. Sagl. IV, 1858 (excl. synonym. Trautv. and Mey.).—*L. fischeri* auct. non Turcz. (1838): Koidz. Fl. Symb. orient.-asiat. (1930) 48 p. p. (quoad pl. sachal.); Kitam. Compos. Japon. III, 193 p. p. (quoad aream Saghal. et excl. synonym.); Sugaw. op. cit. 1859 (excl. synonym.).—*L. fischeri* f. *diabolica* Kitam. in Acta Phyt. et Geobot. III (1904) 170 (p. p. ?); Hara, Enum. spermatoph. Japon. (1952) 227.—*L. speciosa* var. *araneosa* Kom. Fl. Manchzh. III (1907) 695, non DC. (1937).—*lc.*: Sugaw. Illustr. fl. Saghal. IV (1940) tab. 853.

Perennial. Rhizome as in *L. fischeri*. Stem sulcate, usually sparsely pubescent, with brownish hairs or subglabrous from beginning,

sometimes arachnoid-hairy below inflorescence. Leaves bright green above, light glaucescent beneath, sparsely or densely covered with erect, short, thickish, brownish hairs, sometimes mixed with white tomentum; basal leaf usually 1 (sometimes 2), withering early, with long, slender petiole up to 4 times as long as lamina, forming narrow sheath at base, lamina cordate or reniform, up to 27 cm long and up to 42 cm wide, mostly round at apex and with very short mucro, sinuate-toothed, with deltoid, short, acute teeth, less often serrate; cauline leaves 2-3, lower of them like basal leaf but with shorter petiole, 1/2-2/3 as long as lamina or as long, next leaf with much smaller lamina and with short, broadly winged, often sheath-like expanded petiole, upper leaf small, sessile, amplexicaul, sometimes one more leaf above, like bracteal leaves in shape but larger. Inflorescence of (10)15-
 806 55 capitula, often dense, up to 35 cm long, as simple raceme, less often lower elongated peduncles bearing 2(3) capitula; peduncles 2-12 mm long, shorter than involucre or as long, less often slightly longer, only lowermost peduncles up to 2-3(5) cm long; bracteal leaves, like peduncles, covered with crisped, brown, long arachnoid-hairs, as long as peduncles, with involucre including tubular florets exerted from it, only lowermost 2-5, broad, ovate-lanceolate or lanceolate, toothed, other bracteal leaves narrow, almost linear, entire. Capitula including ligulate florets 2.5-3.0 cm in dia, with limb of tubular florets exerted from involucre, initially erect, later drooping and adpressed to stem. Involucre with 2(3) narrow, linear bracts at base, as long as or shorter than involucre, tubular-campanulate; involucre bracts 6-8, dimorphic, 6-10 mm long, compactly imbricate because scarious margins of outer bracts entirely enclosed in longitudinal axis formed by spine and wide scarious margins of inner bracts; all bracts long-acuminate or broad, (inner bracts) short-acuminate, on back densely covered with crisped brownish hairs. Ligulate florets 2-6(8), ligule oblong, 10-15(20) mm long and 2-4 mm wide, sometimes deeply lobed, with 4-5(7) veins, tube 6-7 mm long; style with thin, long stylodes; staminodes often present; tubular florets 17-24, with brownish pappus slightly longer than corolla tube; corolla 9-10 mm long, limb oblong-campanulate, 4.5-5.5 mm long, with oblong-triangular teeth 1.25-1.5 mm long, and tube 4-5 mm long, stamens and styles as in previous species. Achenes blackish-brown, terete-fusiform, narrow, 5-7 mm long; pappus as long as achene. Flowering July to August; fruiting from end of July.

Marsh meadows, scrubs, in forests on grassy areas and in cut-over places with moist soil.—*Far East*: Uda River Area (basin of lower reaches of Amur River and occasionally in Amur valley), Ussuri (southern and eastern parts of district: from Vladivostok and Suchen, along eastern slope of Sikhote-Alin), Sakhalin (Sakhalin Island). Endemic. Described from Serulako on Sakhalin Island. Type in Tokyo University.

Series 2. Racemosae Kitam. Compos. Japon. III (1942) 190 p. p. typ.—Pappus as long as tubular floret or somewhat shorter. Plants usually large, with large leaves; stem thick; inflorescence usually with several capitula; achenes brown.

Besides the species described here, the following European species should also be referred to this series: *L. cacaliiformis* (Reichb.) Nakai (1944) (*Senecio cacaliiformis* Reichb. fil. Icon. Fl. Germ. XVI (1854) 43 tab. 86, excl. syn. and area: Sibir. and Pyren.) and *L. sebennensis* Rouy.

- 807 7. ***L. sibirica*** (L.) Cass. in Dict. Sc. Nat. XXVI (1823) 402; Ldb. Fl. Ross. II, 620, p. p.; Turcz. Fl. baic.-dahur. II, 83; Schmalh. Fl. II, 84 p. p.; Fedtsch. and Fler. Fl. 996 p. p.; Krasch. in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 373; Kryl. Fl. Zap. Sib. XI p. p. (saltem quoad var. *glaberrima* Serg. and var. *gigantea* Serg.); Majeovski, Fl. 593, p. min. p.; Minder. in Ukr. Bot. Zhurn. XIV, 2, 45 p. p. and excl. fig. 1.—*Cineraria sibirica* L. Sp. pl. ed. 2 (1763) 1242 (quoad aream Sibir. and excl. synonym. praeter Gmel.); Ldb. Fl. Alt. IV, 102, p. p.—*Senecio cacaliaefolius* Sch. Bip., in Flora, XXVIII (1845) 50.—*Hoppea sibirica* Reichnb. in Flora, VII (1824) 245; idem. Fl. Germ. exc. I (1830) 240 (quoad typ., excl. specim.).—**lc.** Fedtsch. and Fler. loc. cit. Fig. 996; Krascheninn. loc. cit. Fig. 692.

Perennial. Rhizome short, densely covered with thick or slender adventitious roots, with fibrous remnants of dead leaves at apex. Stem 30–125 cm high and up to 10 mm thick, ribbed-sulcate, green or reddish-violet below, up to inflorescence usually entirely glabrous, or less often sparsely pubescent with few-celled brownish hairs. Leaves thin when dry, less often thick, bright green above, on both sides glabrous or sparsely hairy beneath along veins, less often entirely; basal leaves (2)3, with mostly rather thick petioles, expanded into short sheath, 2–2.5(3) times as long as lamina, lamina of different shapes, mostly cordate or ovate-cordate, less often deltoid-cordate, with length somewhat exceeding width, with deep and narrow, or more or less broad incision, basal lobes somewhat divergent or recurved, usually obtuse, sometimes reniform with strongly divergent, obtuse or short-pointed-subacute lobes, (5.5)9–24 cm long and 7–22 cm wide, sinuate-toothed, with deltoid, mostly broad, short-acuminate teeth; 1–2 lower cauline leaves with slightly smaller lamina and much shorter petiole narrowed into much longer sheath; upper cauline leaves with small deltoid or deltoid-cordate, finely toothed lamina with short petiole, greater part of petiole modified into very broad expanded sheath, very rarely 1, brown or reddish, sessile, amplexicaul, scale-like leaf above, like lower bracteal leaf but larger. Inflorescence of (5)10–52 capitula,

simple, racemose, mostly oblong, up to 12 cm long, stem below inflorescence and peduncles sparsely or densely pubescent, with brownish hair and often also with white arachnoid hairs; bracteal leaves on outer side slightly tomentose, lower leaves ovate-lanceolate, long-acuminate, sometimes in upper part toothed, 2.5–6.0 cm long, carinate, upper ones ovate-lanceolate to linear, somewhat longer than involucre; peduncles thick, lower ones up to 5–10 cm long, usually with 1, very rarely 2 capitula, upper 5–12 mm long. Capitula including ligulate florets 2.5–4.5 cm in dia, obliquely upright, later drooping. Involucre at base with 2 lanceolate-linear or linear bracts as long as or slightly shorter than involucral bracts; involucre campanulate or cylindrical-campanulate, glabrous, often even at base or somewhat arachnoid-hairy, indistinctly biseriate, consisting of 11–12 bracts 9–11 mm long, inner lanceolate and outer lanceolate-linear or linear. Ligulate florets 7–8(11), with oblong-obovate, (10)14–17(20) mm long and 3–5 mm wide ligule with 4–9 veins, tube 5–6 mm long. Tubular florets (18)23–32, with 8.5–9.5 mm-long corolla, their limbs narrow, tubular-campanulate, 4.5–5.8 mm long, with 1.0–1.5 mm-long teeth, but tube usually shorter, 3.0–4.5 mm long; anthers with ovate-lanceolate apical appendages and very short obtuse basal appendages, style branches slender, at apices slightly flattened (spatulately or gradually) into short, flat, obtuse, appendage, outside up to bifurcation covered with short hairs. Achenes 5–6 mm long; pappus sordid brown, approximately as long as achene. Flowering July to August; fruiting from second half of August.

Wet meadows, herb marshes, scrubs along riverbanks, alder groves.—*European part*: Dvina-Pechora, Volga-Kama, Trans-Volga (western part); *Western Siberia*: Ob River Area (southern half of district), Irtysh (eastern part), Altai; *Eastern Siberia*: Lena-Kolyma (south), Angara-Sayans, Dauria (western part); *Far East*: Okhotsk (southern, part of the district: Ayan), Uda River Area (including Faklistov, Belichii, Bolshoi Shantar islands); *Soviet Central Asia*: Lake Balkhash Region (only at eastern border along Kokpektinka River). Described from Siberia. Type in London.

8. *L. lydiae* Minder in Ukr. Bot. Zhurn. XIV, 2 (1957) 48.—*Senecio cacaliiformis* auct. non Reichenb. f.: Meinsh. Fl. ingr. (1878) 173 (sphalm. "*cacaliaefolius* Reichb.").—*Cineraria sibirica* Sobol.? Sanktpeterb. Flora (1802) 163.—an *Cineraria glauca* Sobol.? Ibid. 163, non L. (1763).—*Ligularia sibirica* auct. non Cass. (1823): Rupr. Fl. ingr. (1860) 602; Fedtsch. and Fler. Fl. Evrop. Ross. 996 p. p.; Syreistsch. Fl. Mosk. Gub. III, 279; Majeovski, Fl. 593 p. p.—*Senecio cacaliaefolius* auct. non Sch. Bip. (1845): Schmalh. Fl. II, 86.—*L. sibirica* var. *bohemica* Rupr. in Bull. phys.-math. Acad. Sc. Pétersb.

XII (1854) 213.—**Ic.**: Syreistsch. op. cit. Fig. on p. 279; Minder. loc. cit. Fig. 3.

809 Perennial. Rhizome as in previous species. Stems 1–2, 50–130 cm high, 3–10 mm thick, erect, mostly reddish-violet, particularly in lower part, glabrous up to inflorescence, less often pubescent, with few-celled, brownish hairs, densely below inflorescence and on peduncles with similar hairs often mixed with white arachnoid hairs. Leaves bright green and glabrous above, lighter beneath, scatteredly or somewhat densely, often densely covered with soft, almost floccose, grayish, multicellular, entangled hairs, along margin unevenly, rather often also sinuate-toothed and with short, thickish hairs; basal leaves 1–3, with glabrous, relatively slender petiole 2.5 times as long as lamina and terminating into, elongated, narrow sheath, lamina 7–17 cm long and 7–22 cm wide, of rather different shapes: mainly deltoid-cordate, deltoid-ovate or deltoid-reniform, with deeply cordate or broad, sometimes weakly hastate base, more or less with divergent obtuse or short-acuminate basal lobes, obtuse or short-acuminate; cauline leaves 2–3, lower cauline leaf like basal but with shorter petiole. Next leaf near middle of stem or higher, deltoid-cordate or reniform, with short petiole expanded into large inflated sheath, upper leaf small with petiole modified into inflated sheath, less often 1–2 scale-like, sessile, carinately (folded), amplexicaul leaves above it below inflorescence, like bracteal leaves but larger. General inflorescence simple, racemose (less often 1–2 lower peduncles bearing 2–5 capitula), 6–32 cm long, of 10–36 capitula; peduncles very densely covered with erect, brownish hairs, lower peduncles 2–6(7) cm long, others 4–12 mm long; bracteal leaves brownish-purple, glabrous or weakly arachnoid-hairy, particularly along margin, lower lanceolate, carinately folded, long-acuminate, with few acute teeth in upper part along margin, others narrow, mostly linear, as long as peduncle with capitula. Involucre with 1–2 linear bracts at base, often slightly longer than involucre, cylindrical-campanulate in 2 indistinct whorls; involucre bracts 7–11, dimorphic, 9–11(12) mm long; inner involucre bracts wide, ovate or ovate-lanceolate, with wide scarious border, short- or long-acuminate; outer bracts narrow, lanceolate-linear, long-acuminate, with very narrow scarious border along one or both margins; all involucre bracts green and glabrous on back, apically floccose. Peripheral florets 5–8, with oblong or oblong-linear, 9–17 mm-long and 2.5–4.0 mm-wide, usually seven-veined ligule, tube 3.5–6.0 mm long; tubular florets 19–28, with corolla 8.0–9.5 mm long, its limb 3.25–4.0 mm long, rather narrow, tubular-campanulate, with 1.25–2.25 mm-long narrow-deltoid teeth, tube somewhat shorter, 3.0–3.5 mm long; anthers and style branches identical with those of previous species. Achenes terete, 5–7 mm long; pappus sordid yellow, scarcely longer than achene. Flowering July to August; fruiting August to September.

Marshy meadows, herb marshes, wet scrubs and alder groves.—
European part: Karelia-Lapland (Karelia: materials from its eastern
 part only), Dvina-Pechora (near western border of river), Baltic Region,
 810 Ladoga-Ilmen, Upper Volga, Volga-Don, Upper Dnieper (northeastern
 part). Endemic. Described from Leningrad Region, from Suida River
 in vicinity of the village of Voskresenskoe southward from Gatchina.
 Type in Kiev.

9. *L. abakanica* Poljark. sp. nov. in Addenda, XXV, 887.—*Cin-
 eraria sibirica* auct. non L. (1763): Ldb. Fl. Alt. IV (1833) 102 p. p.
 and excl. syn.—*L. sibirica* var. *hirsuta* Serg. in Kryl. Fl. Zap. Sib. XI
 (1949) 2861.

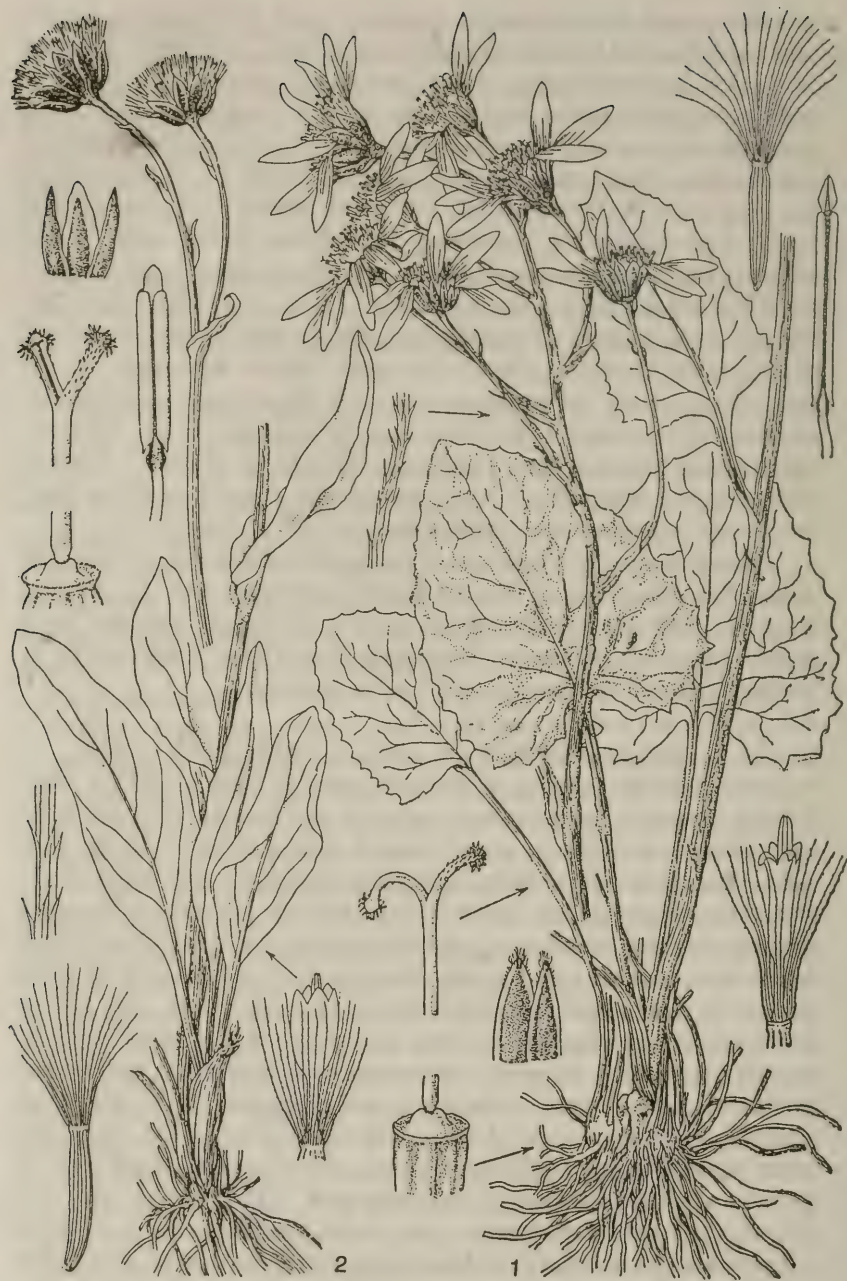
Perennial. Rhizome short, with thick, filiform adventitious roots,
 in upper part covered with fibrous remnants of dead leaves. Stems 1–
 2, 20–70 cm high and 3.5–8.0 cm thick, erect, hard, deeply sulcate,
 woolly or densely floccose throughout, with brown, entangled, flat,
 multicellular hairs. Leaves thick when dry, light green above, sometimes
 slightly colored from anthocyanin, somewhat lighter and densely or
 almost densely pubescent beneath like stem, but hairs shorter, more or
 less uniformly toothed with sharp teeth; basal leaves 1–3, usually 2,
 mainly broadly or roundish-cordate or deltoid-cordate, elongated, less
 often cordate-reniform, 6.5–12.0 cm long and 7–10 cm wide, short-
 acuminate or obtuse, at base mostly with narrow, deep, less often with
 broad notch, with thickish petiole, usually 1.5–2 times as long as lamina,
 but sometimes as long or up to $\frac{2}{3}$ as long, covered with erect and
 dense or tomentose, brownish hairs; cauline leaves 1–3, most often 2,
 lowermost (or 2 lower leaves) identical with basal leaves, usually (but
 not always) with shorter petiole expanded like basal leaves, into narrow
 sheath, upper leaf with small or very small deltoid lamina and short
 petiole, major part of petioles (or entire petiole) modified into broad
 inflated sheath; usually 1–3, sessile, amplexicaul cauline leaves above
 it, identical to bracteal leaves in form consistency and color, but lacking
 axillary peduncles. Inflorescence of 7–21 capitula, racemose, simple
 (very rarely lower peduncle bearing 2–3 capitula), elliptical or oblong,
 6.5–20.0 cm long, usually dense, peduncles thick, lower ones 10–12
 mm long, less often up to 3.5(6.0) cm long, upper ones 2–8 mm long,
 densely covered with brownish multicellular hairs, often like stem below
 inflorescence, also with white arachnoid hairs; all bracteal leaves broad,
 ovate, weakly white-tomentose on back particularly along margin, thin,
 often colored from anthocyanin, often sharply toothed near apex, lower
 ones carinately folded, 2–4 cm long, upper somewhat longer than
 involucre. Capitula including peripheral florets 3.5–4.5 cm in dia,
 obliquely upright, later almost horizontal. Involucre broadly campanulate,

indistinctly in 2 whorls, basally pubescent; with 2(3) linear or linear-lanceolate bracts at base; involucre bracts (7)9–11, dimorphic, glabrous or weakly arachnoid-hairy, 9.5–11 mm long; inner bracts 3–4 mm wide, with wide scarious margin, long- or short-acuminate, outer bracts a half as wide as inner, lanceolate-linear, with very narrow scarious border along one or both margins. Ligulate florets 7–12, with 15–20 mm long and 4–6 mm wide, (5)7–10-veined, oblong or obovate-oblong ligule, their tubes 5.0–6.5 mm long. Disk florets 26–42, with 7.5–9.0 mm-long corolla, limb campanulate or less often narrowly campanulate, 4.5–5.0 mm long, with oblong-deltoid, 1.5 mm-long teeth, tube 2.75–3.5 mm long; pappus whitish-brown, slightly shorter than corolla or slightly short of reaching base of its teeth; anthers with short, ovate-lanceolate, apical appendages and very short basal appendages, antheropodia narrow; style lobes slightly enlarged at tip, capitate, bearing fine papillae, uniformly hairy outside up to base. Achenes narrow, terete, brownish, 5 mm long; pappus approximately as long. Flowering July to August; fruiting second half of August.

Wet meadows, marshy banks of rivers and lakes.—*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans (western part of district; Kuznetsk and Abakan ranges and their foothills; no material from western Sayans). Endemic. Described from Uibat River valley in northern part of Abakan Range. Type in Leningrad.

10. **L. sichotensis** Pojark. sp. nov. in Addenda, XXV, 888.

Perennial. Rhizome as in previous species. Stem 18–80 cm high, 2.0–3.5 cm thick, more or less purple, as also petiole, glabrous up to inflorescence or (only in plants from Svetlaya River) covered with erect, entangled, brown hairs. Leaves in herbarium specimens thick, almost coriaceous, light green above, whitish glaucescent beneath glabrous on both sides or sparsely hairy beneath along veins; basal leaves with petioles a half to two-thirds as long as lamina or as long, slender or (less often) somewhat thick, lamina 5–11 cm long and as wide, cordate or roundish-cordate, with short obtuse lobes at base, roundish or obtuse at apex, sinuate-toothed, with wide, sometimes weakly developed teeth, quite often entire; cauline leaves absent or one usually in lower half of stem, with small, 1.5–2.0 cm long (less often up to 4.5 cm) lamina and usually short petiole, major part of petioles modified into sheath. Inflorescence 3–12 cm long, with (1–3)5–10 capitula; all peduncles with single capitulum, short, usually shorter than involucre (3–10 mm long), rarely lowermost peduncles 2.0–3.5 cm long, more or less densely white tomentose like stem below inflorescence and covered with short erect hairs; all bracteal leaves
812 narrow, almost linear, or lowermost leaves narrowly lanceolate, green



or slightly purple and weakly arachnoid-hairy, usually all leaves longer than corresponding peduncles; less often lowermost leaves shorter than peduncles; usually 1–4 such leaves below inflorescence, but lacking axillary peduncles. Capitula 3.5–4.0 cm in dia. Involucre campanulate or campanulate-cylindrical with 2 long bracts at base, usually as long as involucre; involucre bracts 7–8, (8)9–10 mm long, acuminate, dimorphic; inner bracts ovate, with wide scarious margin; outer lanceolate, with narrow scarious margin, glabrous on back, sometimes with occasional thickish hairs or sparsely white-arachnoid-hairy. Ligulate florets (4)5–7, with oblong-elliptical, 10–17 mm long ligule and 5(7) mm long tube. Tubular florets about 20, with 8–9 mm long corolla; their limb narrowly campanulate, as long as tube; style branches spatulately enlarged into short roundish appendage. Pappus somewhat shorter than corolla, reddish-brown; achenes (immature) 5–6 mm long. Flowering: end of July to August.

Dry stony and mountain-meadow slopes, edges of forests, edges of marshes, from seacoasts to alpine bald zone.—*Far East*: Ussuri (only eastern slope of Sikhote-Alin) Endemic. Described from Botcha River valley. Holotype in Leningrad; isotypes in Leningrad and Vladivostok.

11. *L. subsagittata* Pojark. sp. nova in Addenda, XXV, 889.—*Cineraria sibirica* auct. non L. (1763): MB. Fl. taur.-cauc. II (1808) 313; C.A. Meyer. Verzeichn. 82.—*Ligularia sibirica* auct. non. Cass. (1823): Ldb. Fl. Ross. II, 2 (1845–1846) 620, p. min. p. (quoad pl. cauc.); Grossh. Fl. Kavk. IV, 155.—*Senecio calcaliaefolius* auct. non Sch. Bip. (1845): Schmalh. Fl. II (1897) 84, p. min. p. (quoad pl. cauc.).

Perennial. Rhizome short, densely covered with adventitious roots. Stem at base with slender fibrous remnants of dead leaves, erect, strong, sulcate-ribbed, glabrous up to inflorescence, purple at base and below inflorescence, sometimes entirely, 25–90 cm high and 4–7 mm thick. Leaves, when dry (herbarium material), rather thick, less often thin, bright green and glabrous above, lighter beneath, glaucescent, entirely covered with dense, less often sparse, short, simple, flat, white, later usually brown hairs; basal leaves 2–3, with glabrous petioles 1.5–2.5 times as long as lamina, expanded into semiamplexicaul short and
815 narrow sheath, lamina more or less cordate or sagittate, less often deltoid-sagittate, usually up to 1.5(2) times as long as wide, 5.5–18(24) cm long, 4.5–15 cm wide, short-acuminate or obtuse, with deep a notch and large lobes at base, acuminate or obtuse, recurved or more or less divergent, toothed, with uneven, large, deltoid, acuminate or sometimes obtuse teeth, with involute glabrous margin; lower cauline

leaf like basal leaves, but with shorter petiole and longer sheath, next leaf with smaller lamina; and petiole usually not longer than lamina, larger part of petiole modified into flat sheath; upper cauline leaf with very small lamina and broadly inflated sheath, usually (1)2–6 sessile, amplexicaul, scale-like, violet leaves above it like bracteal but larger. Inflorescence simple, racemose, usually oblong. 4.5–30(34) cm long, with 7–35 capitula, horizontal, later downwardly deflexed; stem below inflorescence and peduncles sparsely or densely covered with erect, thickish, simple, brown hairs, sometimes also with white arachnoid hairs. Bracteal leaves large, brownish-violet, sessile, glabrous or weakly arachnoid-hairy; all bracteal leaves lanceolate, finely, thin, long-acuminate or upper leaves almost linear, lower 22–35 mm long, carinately folded; upper leaves usually somewhat longer than involucre, lower peduncles up to 3.5 cm long, upper 0.3–1.0 cm long. Involucre campanulate-cylindrical or almost cylindrical, in 2 indistinct whorls, with 2 bracts at base, almost as long as involucre; involucre bracts 8–10, thin, papery, pale, greenish or more or less anthocyanin-colored, 10–12(14) mm long, glabrous or with occasional thickish, erect or appressed arachnoid hairs; inner bracts lanceolate, with wide scarious border; outer bracts linear, lacking scarious border and with very narrow border along one or both margins; all bracts long-acuminate. Ligulate florets 7–12, with oblong-elliptical or linear-oblong ligule, slightly longer than involucre bracts, 8–15 mm long and 2.5–3.5 mm wide, with 4–5 veins; tube 4.0–5.5(7.0) mm long. Tubular florets 17–32, with 8–11 mm-long corolla; limb narrowly campanulate, 3.5–5.0 mm long, with narrowly deltoid, 1.0–1.5 mm-long teeth; tube 4.0–5.5 mm long; style branches curved, slender, slightly spatulately enlarged at apex, roundish at apex, and covered with very small papillae, densely covered on outside up to base, with short pointed hairs, inner side almost entirely occupied by stigma surface. Achenes narrowly terete, 5–6 mm long; pappus whitish-reddish-brown, as long as achene. Flowering July to August; fruiting September.

Wet alpine meadows.—*Caucasus*: Ciscaucasia, Glavnyi [Main] Caucasus Range, Dagestan, Eastern and Western Transcaucasia, reported also from Southern Transcaucasia. *General distribution*: Armenia and Kurdistan (Kars Region). Described from vicinity of the village of Kazbek. Type in Leningrad.

- 816 *Series 3. Longipedes* Pojark.—Plants occasionally more than 70 cm high, with slender stem and rather thin, and mostly very long petioles of basal leaves; lamina of basal leaves small, 1.5(8) 10 cm long, mostly with long lobes at base. Inflorescence of small number of capitula.

The following three species are included in this series.

12. ***L. longipes*** Pojark. sp. nova in Addenda, XXV, 890.—*L. sibirica* auct. fl. sib. non Cass. (1823): Turcz. Fl. baic.-dahur. II (1846) 83 (and var. *alpestris minor*...); DC. Prodr. VI, 315, p. min. p. (quoad pl. Sibir. baic.); Ldb. Fl. Ross. II, 620, p. min. p.; M. Popov, Fl. Sr. Sib. II, 742, p. max. p.—*L. sibirica* var. *gracilis* Serg. in Kryl. Fl. Zap. Sib. XI, 2860 p. p.

Perennial. Rhizome short, thick, densely covered with filiform adventitious roots, and in upper part more or less densely covered with fibrous remnants of dead leaves. Stem 30–65 cm high and 1.5–2.5 mm thick, slender, sparsely leafy, finely sulcate, glabrous, hairy only below inflorescence, in lower part, but sometimes throughout, more or less purple. Leaves thin when dry (herbarium specimens) but relatively thick, light green above, paler beneath, glaucescent, on both sides entirely glabrous, rather uniformly sinuate small-toothed, with broadly deltoid teeth, abruptly narrowed into short callous acute tips; basal leaves 2–3(4), petiolate, petiole glabrous, very thin, 0.75–2.0 mm thick, and 2.5–5 times as long as lamina, often bright purple, lamina 2.3–8.0(10.0) cm long and as broad, often elongated, sagittate, deltoid-sagittate, or deltoid, less often reniform-sagittate or reniform-cordate, mostly acute, less often obtuse, deeply lobed, with large lobes at base, often as long as other part of lamina or up to two-fifths to two-thirds as long, acute or roundish at apex; cauline leaves mostly 2, less often 3, lower leaf identical to basal but sometimes with shorter petiole and broader amplexicaul base, upper leaf distant from it, with very small lamina and petiole modified into broad, inflated sheath, sometimes one more leaf with intermediate shape in between them in upper part of stem; often 1–2(3) scale-like leaves below inflorescence like bracteal leaves but usually larger. Inflorescence 1–2 ("*L. sibirica* var. *alpestris* Turcz."); capitula 3–15(20) aggregated in lax, always simple raceme, 3–10(20) cm long; capitula including ligulate florets 2.0–3.5 cm in dia, on short peduncles; upper peduncles 2 mm long, lower 8–30 mm long (in certain cases lowermost peduncle up to 4–7 cm long), obliquely upright, later strongly drooping, parallel to stem; stem below inflorescence as well as peduncles sparsely covered with thickish, simple, white hairs, later turning brown. Involucre cylindrical and
817 narrowly campanulate with 1–2 filiform or lanceolate-linear bracts at base; involucre bracts 7–8, 8–11 mm long, glabrous except floccose apices, but more or less anthocyanin-colored; inner bracts lanceolate-ovate with wide scarious margin, short-acuminate; outer bracts narrower, linear or lanceolate-linear, finely long-acuminate. Ligulate florets 6–7, usually with oblong 11–15 mm-long and 3–4 mm-wide ligule; tube 4.5–6.0 mm long. Disk florets 15–20, with 7.0–9.5 mm-long corolla; limb rather broadly campanulate, 3–4 mm long, with about 1 mm-long

teeth, but tube 3–4 mm-long; anthers with narrow and long apical appendage and very short, subobtusate, basal appendage, antheropodia long; style branches slender with slightly enlarged roundish appendage, on outer side up to base covered with short conical hairs. Achenes light-colored, 5–6 mm long; pappus pale, weakly reddish-brown, slightly longer than achene. Flowering July to August; fruiting September.

Marshy and saline meadows, river valleys, herb marshes, taiga and steppe as well as alpine bald zone.—*Western Siberia*: Ob River Area (southeastern part), Altai; *Eastern Siberia*: Lena-Kolyma (southern part of river), Angara-Sayans, Dauria; *Far East*: Zeya-Bureya (except northern part), Ussuri, including Pacific Coastal Region (evidently very rarely). *General distribution*: Mongolia (northern part). Described from Trans-Baikal Region from the village of Konstantinovka in Eravo Lakes region. Type in Leningrad.

13. *L. arctica* Poljak. sp. nova in Addenda, XXV, 891.—*L. sibirica* var. *minor* Nym. Consp. fl. Europ. (1879) 350.—*L. sibirica* var. *gracilis* Serg. in Kryl. Fl. Zap. Sib. XI (1954) 2861 p. p.—*L. sibirica* auct. non Cass. (1823); Fedtsch. and Fler. Fl. (1910) 996 p. p.; Hilt. Suom. Kasv. (1933) 709 p. p.

Perennial. Rhizome as in previous species; plant wholly glabrous excluding upper part of stem, peduncles, and base of involucre covered with thick, brownish, simple, hairs. Stem 15–70 cm high, slender, 1.5–3.0 mm thick, sparsely leafy, often entirely violet-purple, less often green in middle. Leaves in herbarium specimens thin, but sometime rather thick, bright green above, light green beneath; basal leaves usually 2, cordate, small, (1.7)2–7(11) cm long and 2.2–7.0(10.0) cm wide, deltoid-cordate, cordate, or cordate-sagittate, obtuse or short-acuminate, with divergent obtuse or less often short-acuminate lobes at base, mostly short, irregularly toothed, with deltoid, mostly broad teeth, with short callous acute tip, sometimes with inconspicuous, remote teeth with only 1 short cusp, their petioles thin, 1.5–2(3) times as long as lamina; lower cauline leaf identical with basal leaves but with shorter petiole and longer sheath, sometimes one more leaf in upper part with very
818 small lamina and petiole entirely or almost entirely modified into amplexicaul sheath; sometimes 1 scale-like sessile, lanceolate leaf below inflorescence like bracteal leaves but larger. Inflorescence simple raceme, lax, with few, 2–7(12) capitula; lower peduncles 12–35(50) mm long, upper 6–10 mm long; bracteal leaves brownish-violet, lower ovate or more often lanceolate, long-acuminate, usually entire, enveloping peduncle and involucre, upper lanceolate or linear. Capitula including ligulate florets 2–3 cm wide, later drooping. Involucre cylindrical or cylindrical-campanulate, with 2 linear or filiform bracts

at base; involucre bracts 6–8(9), 6–10(12) mm long, glabrous, more or less entirely purple; inner bracts lanceolate or almost ovate, with wide scarious margin; outer bracts lacking scarious border or with very narrow membranous border on one or both sides. Ligulate floret 5–6(7), with linear or oblong ligule 8–10 mm long and 1.25–4.0 mm wide, with 3–6 veins; tube 3–4 mm long. Tubular florets 17–26, with 7–8 mm-long corolla; limb campanulate, often wide, 3.0–3.5 mm long, with deltoid teeth, about 1.5 mm long usually abruptly narrowed into narrow tube 3 mm long; anthers and style branches like previous species. Achenes narrowly terete, 5.0–6.5 mm long; pappus whitish-reddish brown, slightly longer than achene. Flowering from end of June to August; fruiting August to September.

Marshy meadows, herb marshes, marshy and stony banks of rivers, less often scrubby tundras and forest glades.—Arctic Europe; *European part*: Karelia-Lapland (Kola Peninsula, eastern Karelia up to Lake Onega, Urals (along ridge as far as Southern Urals inclusively); *Western Siberia*: Ob River Area (only northwestern). Endemic. Described from Pae-Khoi Range on Kanin Peninsula. Type in Leningrad.

14. **L. bucovinensis** Nakai in Journ. Jap. Bot. XX (1944) 135 (sphalm. "*bucoviensis*").—*Cinenaria sibirica* auct. non L. (1763): Bess. Enum. pl. Volhyn. (1822) 33.—*Senecio cacaliaefolius* auct. non Sch. Bip. (1845): Knapp. Pfl. Galiz. Bukow. (1872) 132 (sphalm. "*cacaliformis* Sch. Bip."), excl. synon.; Schmalh. Fl. II, 84 p. min. p.—*L. sibirica* auct. non Cass. (1823): Ldb. Fl. Ross. II (1844–1846) 620, p. min. p. (quoad specim. volhyn.); Grecescu Consp. fl. Roman. 132; Prodan, Fl. Roman. I, 2, 1029; Katina in Vizn. Rosl. URSR, 352; Szafer. Kulcz. Pawl. Rosl. Polsk. 698 p. p.? (saltem quoad aream Wyz. Lub.).—*L. ucrainica* Minder. in Ukr. Bot. Zhurn. XIV (1957) 46.—*Id.*: Grecescu, loc. cit.; Minder. op. cit. Fig. 2.

Perennial. Rhizome strongly shortened, covered with slender, filiform, adventitious roots and above with thin fibrous remnants of dead leaves. Stem erect, 30–75(100) cm high, 2.5–5.0 cm thick, sulcate, purple in lower part or less often entirely, glabrous up to inflorescence or with occasional, erect, brown, multicellular, thickish hairs, but below
819 inflorescence always densely covered with similar hairs and often also with long, thin, white, arachnoid hairs. Leaves on both sides glabrous or with occasional, thickish, short hairs beneath on prominent veins and margin; leaves of sterile rosettes and basal leaves with long (2.5–4 times as long as lamina), very thin, glabrous, often purple, petiole and deltoid cordate, often almost sagittate lamina, with long and usually acuminate, divergent lobes at base, mostly acuminate, not quite uniformly sinuate-toothed with acute, almost serrate teeth, 4–9 cm long

and 5–10(14) cm wide; cauline leaves 2(3), with shorter petiole expanded into long, inflated sheath, upper cauline leaf sometimes sessile; upper 1–4 scale-like leaves sessile, amplexicaul, carinately folded like lower bracteal leaves. Capitula (5)7–20, usually in simple, short, and lax panicle; peduncles 3–8 mm long, only lowermost up to 3.0–4.5 cm long, white-arachnoid-hairy, and with erect, brownish hairs, erect, later drooping in upper part; bracteal leaves more or less violet-purple, lower and sometimes almost all lanceolate, long-acuminate, sometimes partially toothed, lower carinately folded and enveloping peduncle, upper often almost linear, usually somewhat longer than involucre. Involucre with 2–3 narrowly linear bracts at base, approximately as long as involucre, narrowly campanulate; involucre bracts 7–9 dimorphic, in 2 indistinct whorls; inner bracts narrowly lanceolate, with very narrow scarious border on both or one side; all bracts long-acuminate, glabrous on back, apically floccose. Ligulate florets 6–8 with oblong, 13–17 mm long and 2.5–4.0 mm wide, 7–8-veined ligule; tube 5–7 mm long. Tubular florets about 20–24, with 9.0–10.5 mm-long corolla; limb 3.0–3.5 mm long, oblong-campanulate, with 1.25–1.5 mm-long narrow-deltoid teeth; tube 4–5 mm long; anthers with long, narrowly lanceolate apical appendages and very short basal appendages, antheropodia short; style branches narrow, with somewhat enlarged appendages, capitate or acute, on outside up to base covered with very short, thickish hairs. Achenes (immature) 4–5 mm long, narrow, almost terete; pappus brownish, slightly longer than achene. Flowering July to August.

Marshy meadows, mossy marshes, wet forests of *Alnus glutinosa*. [black, common or European alder]. *European part*: Upper Dnieper and Upper Dniester (very rarely). *General distribution*: Central Europe (Polish highland and Eastern Carpathians and, apparently, Transylvania). Described from western Bukovina (Romania). Type in Tokyo University.

Section 3. Stenostegia Pojark. sect. nova in Addenda, XXV, 892.—Bracteal leaves at base of peduncles narrow, linear or subulate, mostly shorter than lower peduncles; pappus of white, soft hairs; stigma surface occupying whole of inside of style branches or excluding narrow middle groove; antheropodia broader than filament; leaves green, mostly soft, not fleshy.

Type of section: *L. narynensis* (Winkl.) O. and B. Fedtsch.

Species mainly of Soviet Central Asia and Central Asia.

Subsection 1. Oligocephalae Pojark. subsect. nova 1. c. 892.—Capitula large or medium, solitary or up to 10, in racemose inflorescence; involucre goblet-shaped; rhizome densely tomentose.

Type of subsection: *L. narynensis* (Winkl.) O. and B. Fedtsch.

This subsection includes Soviet Central Asian species that form a very natural group, which may be considered as a series.

15. ***L. robusta*** (Ldb.) DC. Prodr. VI (1837) 316; Ldb. Fl. Ross. II, 621; Kryl. Fl. Zap. Sib. XI, 2863.—*Cineraria robusta* Ldb. Fl. Alt. IV (1833) 106.—*Senecio robustus* Sch. Bip. in Flora, XXVIII (1845) 50.—*S. robustus* α . *typica* auct. non Trautv. (1866): Franch. in Bull. Soc. bot. Fr. XXXIX (1892) 300 p. p. (quoad pl. alt.).—**lc.**: Ldb. Ic. Fl. Ross. Alt. IV, tab. 354.

Perennial. Rhizome short, densely covered with numerous filiform adventitious roots; stem solitary, simple, 25–80 cm high, basally up to 7 mm thick, strong, erect, ribbed, densely covered with fibrous remnants of dead petioles and thick layer of brownish tomentum at base, initially, like leaves, sparsely floccose or tomentose above. Leaves glabrescent; lower cauline leaves with long (almost 1.5, less often almost about 2 times as long as lamina) petiole, somewhat enlarged toward base, lamina ovate-cordate, wide, less often oblong, acuminate, 3–13 cm long and 3–10 cm wide; middle cauline leaves smaller than lower ones and narrower, ovate or oblong-ovate, usually with shallow notched base, long-acuminate, petioles usually as long as lamina; margins of lower and middle leaves toothed with coarse, sharp teeth; upper leaves strongly reduced, sessile, narrow, rhombic-lanceolate or lanceolate, undivided or partly toothed. Capitula more or less drooping, large, including
821 ligulate florets (5) 6–7.5 cm in dia, solitary or 2–5, borne singly at apices of long, 3 cm (upper ones), 8–16 cm-long, upright, very (lower ones on 5–9 cm) remote thick peduncles. Involucre hemispherical, with 3–4 very narrow bracts at base, green or less often slightly anthocyanin-colored, initially arachnoid-hairy, later glabrous; involucre bracts (10) 15–17 mm long, inner bracts broadly elliptical, with wide scarious margin; outer bracts narrower, oblong-elliptical or lanceolate, with or without very narrow membranous border. Ligulate florets 8–15, linear and oblong-elliptical to (less often) narrow-obovate, with ligule (2) 3 cm long and (3.5) 5–8(13) mm wide. Corolla of tubular florets about 9 mm long; tube a half as long as limb, limb lobed approximately up to a fourth in narrowly deltoid acute teeth; basal appendage of anthers short; style branches subacute or obtuse, with hairs on outer side only near apex or up to middle, usually subglabrous in ligulate florets. Achenes terete, somewhat flat, 6.5–7.0 mm long and about 1.5 mm wide, light brown, ribbed-sulcate; pappus snow-white, as long as corolla of tubular florets. Flowering June to July; fruiting from August.

Stony and rubbly slopes of steppe.—Altai (western part). Described from material from western Altai from Kerlyk and Kan rivers. Type in London.

16. **L. kareliniana** Stschegl. in Bull. Soc. Nat. Mosc. XXVII, 1 (1854) 176.—*L. robusta* var. *kareliniana* O. and B. Fedtsch. Perech. Rast. Turk. III (1909) 212 p. p.

Perennial. Rhizome strongly shortened, densely covered with slender, filiform adventitious roots and, like base of stem, with brownish tomentum and stiff fibrous remnants of old dead petioles. Stem solitary, 35–46 cm high, basally 3.5–4.0 m thick, erect, ribbed-sulcate, as also petiole, floccose-tomentose and more or less purple. Leaves grayish-tomentose-floccose beneath; subglabrous above; basal and lower cauline leaves on thin, long, semi-amplexicual petioles, expanded toward base, (1.5)2–4(8) times as long as lamina; lamina of lower cauline leaves 4.5–7.0 cm long and as much wide (basal leaves smaller), cordate or roundish-cordate, obtuse, less often some mucronate, sinuate-toothed with small and often remote teeth or sinuate; middle cauline leaves 2–3, with shorter petiole, as long as lamina or a half as long, narrower, oblong-ovate and rhombic-ovate to ovate-lanceolate, upper leaves sessile, rhombic-oblong to lanceolate and (uppermost leaves) linear, with sharp, small, remote teeth to entire. Capitula 5.0–6.5 cm in dia 822 (including ligulate florets), less often solitary, usually 3–4(6), solitary, on short, slender, more or less drooping peduncles 1.0–2.5 cm long, narrowed at apices of stem, lower capitula sometimes slightly remote and with longer, peduncles up to 3.5 cm. Involucre hemispherical, 1.5–2.0 cm in dia, up to 2.5 cm in upper capitulum, sparsely arachnoid-hairy, with 2–4 bracts at base; involucre bracts 8–12, oblong-elliptical; inner bracts much broader (sometimes broadly elliptical), with wide membranous, usually purple margin; outer bracts with narrow membranous margin. Ligulate florets 12–15, with 1.6–2.5 cm-long and 2.5–6.0(9.0) mm-wide, narrowly-linear to oblong-elliptical ligule, tubular florets (5.5)6.0–6.5 mm long; tube 1/2–3/7(1/3) as long as lamina, incised up to a fourth (a fifth) length into acute, narrow deltoid teeth; basal appendage of anthers short; style branches apically narrowed, obtuse or subacute with hairs on outer side only below appendage or slightly lower, glabrous or with occasional hairs on outer side in ligulate florets. Achenes immature, about 6 mm long, ribbed-sulcate. Flowering first half of June to first half of August.

Meadows and stony slopes of subalpine zone.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Saur and Tarbagatai mountains). Endemic. Described from Tarbagatai. Type (if not lost) in Moscow.

Note. In the description of this, presently forgotten species, Stschegleev quite correctly noted its main differences from the Altaian *L. robusta* (Ldb.) DC.: smaller capitula, with narrower, usually purple involucre, on short peduncles aggregated at the apices of the stems; lower and middle cauline leaves broader, obtuse or only mucronate, their petioles longer than lamina; besides the leaves have smaller teeth and throughout remain grayish-tomentose beneath. In its morphological characteristics, this narrowly endemic species occupies an intermediate position between *L. robusta* (Ldb.) DC. and *L. narynensis* Winkl.

17. ***L. narynensis*** (Winkl.) O. and B. Fedtsch. Perech. Rast. Turk. III (1909) 212.—*Senecio robustus* var. *typica* Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 2 (1866) 362; Franch. in Bull. Soc. Nat. Fr. XXXIX, 300 p. p. (quoad pl. alata.).—*Senecio robustus* var. *kareliniana* Trautv. loc. cit.; Franch. loc. cit.—*Senecio narynensis* Winkl. in Tr. SPb. Bot. Sada, XI (1890) 319; Franch. loc. cit.—*L. robusta* var. *typica* O. and B. Fedtsch. loc. cit.—*L. robusta* var. *kareliniana* O. and B. Fedtsch. loc. cit. p. p.—*L. robusta* auct. fl. turkest. non DC. (1837).—*L. robusta* f. *turkestanica* Krasch. in sched.

823 Perennial. Rhizome short, covered with slender, filiform, adventitious roots and together with stem base, densely covered with lax brownish tomentum and stiff fibrous remnants of dead petioles. Stem solitary or less often 2–4, 30–70 cm high, at higher altitudes sometimes 14–17 cm high, usually somewhat flexuous, soft, sulcate, floccose-tomentose, sometimes subglabrous below apex. Leaves glabrous above or only partially, mainly in middle, discontinuously floccose-tomentose, grayish beneath up to end of vegetative growth, usually densely arachnoid-hairy; leaves in basal rosette and lower cauline leaves crowded, roundish and roundish-cordate to ovate-cordate, (1.7)3–12 cm long and up to 10 cm wide, obtuse or mucronate usually with deeply cordate, less often almost hastate or truncate base, with petiole as long as lamina or 1.5–2 times as long; middle cauline leaves usually remote, lower leaves 1(2) among them, like upper leaf but with shorter petiole, others transitional to upper leaf, narrower, oblong-elliptical to lanceolate, short-petiolate, with small remote teeth; upper cauline and bracteal leaves small, narrow, lanceolate, entire, acuminate, sessile. Capitula aggregated at stem apex, usually 4–10(14), in racemes to almost corymbose inflorescence, elongated in lower part, sometimes with branched peduncles; upper 3–4 capitula usually on short (1–4 cm long) peduncles, more or less crowded, lower ones remote on 3–8(11) cm and longer peduncles up to 8(10) cm, sometimes bearing 2–3(4) capitula, in short, particularly high-altitude specimens, capitula in all 1–2. Capitula drooping, including ligulate florets capitula at apex

(4.5)5–6 cm in dia. Involucre campanulate, 1–2 cm in dia, usually arachnoid-tomentose, particularly at base, with 1–2 lanceolate bracts at base; involucre bracts (8)10–15 in upper capitula and 8–10 in others, green or purple; inner bracts narrowly elliptical to broadly elliptical, with wide membranous margin, upper ones narrowly elliptical, with scarcely membranous margin; all bracts abruptly narrowed into mucro, short-ciliate and covered with lax, tomentum. Ligulate florets 8–14(17), with linear-oblong to elliptical ligule, 1.4–2.5 cm long and 2–7 mm wide, sometimes filiform staminodes also present; style branches hairy outside only near apex or slightly below. Tubular florets 7.5–9.0 mm long; corolla tube $1/2$ – $2/3$ as long as limb lobed up to $(1/5)1/4$ – $1/3$ into oblong- or narrow-deltoid teeth; appendage of style branches obtuse or subacute, hairy outside, sometimes up to middle; anthers with ovate-lanceolate, acute apical appendage and very short deltoid basal appendage. Achenes 5–6 mm long and 1.0–1.5 mm wide, narrowed toward base, ribbed-sulcate. Flowering June to July; fruiting end of August to September. (Plate XXXVIII, Fig. 1).

Mountains from forest to alpine zone (up to 3,600 m), forest, subalpine and alpine meadows, mountain steppes, open stony and rocky slopes, talus and gravel beds.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (only Dzhungarian Alatau), Tien Shan (entire Eastern and Central Tien Shan, Trans-Ili Range, eastern part of Kirgiz Range, western slope of Fergana Range), Pamiro-Alai Region (Alai and Trans-Alai ranges). *General distribution*: Dzhungaria-Kashgaria (southwestern Dzhungaria and western Kashgaria). Described from Central Tien Shan (Kirgizia), from Naryn River. Type in Leningrad.

18. **L. karataviensis** (Lipsch.) Pojark. comb. nova.—*Senecio karataviensis* Lipsch. in Fedde, Repert. sp. nov. XLII (1937) 160.

Perennial. Rhizome covered with filiform adventitious roots and with fibrous remnants of dead leaves at root collar, densely covered with brownish woolly tomentum. Stem erect, 15–35 cm high, sulcate, densely pubescent below, sparsely above. Leaves thick, almost coriaceous; basal and lower cauline leaves with long (4–14 cm) petiole 2.5–3 times as long as lamina, densely arachnoid-tomentose with erect hairs, their lamina reniform or deltoid-reniform, basally cuneate, (2)3–6 cm long and 2.5(4–5) cm wide, unevenly toothed with coarse, obtuse or acute teeth; middle cauline leaves 3–4, gradually reduced upward, deltoid-ovate, upper leaves among them lanceolate, sinuate-toothed or entire, short-petiolate or sessile; upper cauline leaves small, linear, mostly entire. Capitula including ligulate florets 1.5–2.0(2.5) cm in dia, 3–7, aggregated at stem apex in racemose or somewhat corymbose inflorescence. Involucre goblet-shaped, with few, lanceolate, small, 2–

4 mm long bracts at base; involucre bracts 8–11 mm long, dimorphic: inner bracts oblong-obovate, rather short-acuminate, with wide scarious margin; outer bracts narrowly lanceolate, long-acuminate, on both or only one side with narrow scarious fringe; all bracts glabrous outside, in upper part along margin rather short-ciliate and floccose at tip. Ligulate florets about 10, with yellow, oblong-elliptical, 10–14 mm long and 3–4 mm wide ligule with (7)9 veins; tube 5 mm long. Tubular florets about 30, with narrow-campanulate almost tubular, 5 mm long limb; tube 2 mm long; stamens with very short basal appendages of anthers and weakly enlarged antheropodia; style branches short, with conical, short, acute appendage, with a tuft of long hairs outside below appendage and occasional short hairs, almost up to bifurcation of style. Achenes brownish, 5–6 mm long, ribbed; pappus white. Flowering second half of May to June.

Gravel beds and stone fields.—*Soviet Central Asia*: Tien Shan (western part of Karatau Mountains and also, according to personal communication of O.V. Czerneva, Akatau and Akbashtau mountains, 825 Chatkal and Talass ranges). Endemic. Described from Kazakhstan from Bayaldyr Gorge and Karatau Range. Type in herbarium of Moscow State University.

19. **L. schischkinii** Rubtz. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VII (1938) 138.—*Senecio schischkinii* Lipsch. in sched.

Perennial. Plant short with small leaves; rhizome short, covered like base of stem with brownish, soft tomentum and densely covered with filiform adventitious roots. Stem solitary, simple, 6–14 cm high, slender, at base 1.5–2(3) mm thick, soft, mostly bent, as also petiole, entirely but later, only in upper part, white-arachnoid-floccose-tomentose basally covered with fibrous remnants of dead petioles. Leaves sparsely floccose to glabrous above, grayish-arachnoid-hairy beneath, later usually glabrous, often purple, particularly along veins; leaves of sterile rosette and basal leaves 1.5–3.5(4.5) cm long and as wide, almost round or broadly cordate, rarely almost reniform, entire or sinuate-toothed with small remote teeth, with petiole 1.5–2 times as long as lamina, but sometimes as long or, in lowermost leaves up to 4–6(8) times as long as lamina; middle cauline leaves 1–2, sometimes like lower leaves but more often like upper leaves, i.e., sessile or short-petiolate and with small, lanceolate, acuminate, entire lamina. Capitula drooping, solitary at apex of stem (very rarely second capitulum developing nearby on very short, 0.7 mm-long peduncle), including ligulate florets 3.5–4.0 cm in dia. Involucre broadly campanulate, purple, 10–15 mm in dia, with 1–4 short, narrow subulate bracts at base; involucre bracts 10–12; inner bracts oblong to quite

broadly elliptical, with wide scarious margin; outer bracts oblong, almost lacking scarious margin; all bracts arachnoid-hairy at least at base and on acuminate tip. Ligulate florets 10–14, with oblong, less often rather broadly elliptical, ligule; style branches subglabrous outside, obtuse. Corolla of tubular florets 8.5–10.5 mm long; tube about $\frac{2}{3}$ as long as limb; limb lobed up to $(\frac{1}{4}) \frac{1}{5}$ in narrowly deltoid teeth; style branches with short-pointed, conical tip, rarely obtuse, with tuft of hairs only outside, subterminal or almost up to middle of branch. Achenes (immature) 6.0–6.5 mm long, narrowly terete, ribbed-sulcate. Flowering July.

Alpine zone on stony mountain slopes.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Saur, Tarbagatai and Dzhungarian Alatau Mountains), Tien Shan (only northeastern part, Ketmen Mountains). Endemic. Described from Tarbagatai. Lectotype and its duplicate in Leningrad.

Note. *L. schischkinii* is an alpine species very similar to *L. kareliniana*, from which it is distinguished by, besides low stature, small, roundish, rather obtuse, lower cauline leaves that are usually 826 glabrous at anthesis; smaller, usually solitary capitula with narrower involucre; and also a tubular floret corolla with relatively longer tube and less deeply lobed limb.

Subsection 2. Racemiferae Poljak. subsect. nova in Addenda, XXV, 893.—Capitula rather large (4.0–4.5 cm in dia), aggregated in large number into long oblong raceme; basal leaves reniform-deltoid-ovate; rhizome glabrous (lacking pubescence).

There are two very closely related species in Korea, one of which occurs in Ussuri Territory.

Type of subsection: *L. jaluensis* Kom.

20. *L. jaluensis* Kom. in Tr. SPb. Bot. Sada, XVIII (1901) 420; Fl. Manchzh. III, 695; Nakai, Fl. Korean. II, 38; Kom. and Alis. Opred. Rast. Dalnevost. Kr. II, 1053.—*Senecillis jaluensis* Kitam. in Acta Phyt. et Geobot. VIII (1932) 82.—*L. pulchra* Nakai in Bot. Mag. Tokyo, XXXI (1917) 126; Bull. Nat. Sc. Mus. XXXI, 117.

Perennial. Rhizome short, covered with numerous, strong filiform adventitious roots, in upper part with scaly blackish remnants of dead petioles. Stem 65.200 cm high, 6–10 mm thick at base, erect, sulcate, usually densely covered with brown, flexuous (glandular?) hairs and white-arachnoid-hairy mainly below inflorescence. Leaves in dry condition, rather thick, bright green and glabrous above, lighter and finely tomentose or glabrous beneath; basal leaves usually 2, 18–37 cm long and 17–35(40) cm wide, reniform-deltoid or deltoid-ovate,

broadly or deeply cordate or almost hastate at base, obtuse or subacute, with long winged petiole, 1.5(2.5) times as long as lamina, often expanded, up to 6 cm wide, like stem entirely hairy or only in upper part, or only near sheath-like expanded base, uniformly toothed with sharp teeth; cauline leaves also 2, much smaller and narrower, 10–22 cm long, 10.5 cm wide, cordate-hastate to lanceolate, on short, broadly winged petiole or sessile, amplexicaul; bracteal leaves strongly reduced, narrowly lanceolate or linear, entire. Inflorescence 18–50 cm long, as narrow, long, simple raceme or with lateral branches in lower part bearing racemes of more or less 5 capitula; peduncles of capitula 7–50 mm long, like stem usually densely covered with dark, reddish, short hairs and sometimes with occasional white-arachnoid hairs. Capitula including ligulate florets 4.0–4.5 cm in dia. Involucre campanulate, with truncate base, 11–12(13) mm long and up to 15 mm in dia, with 1–3 small, almost filiform bracts at base or lacking them; involucre bracts 8–10(12); inner bracts oblong elliptical or lanceolate, with rather broad scarious margin covering narrowly lanceolate outer
 827 bracts with narrow scarious margin; all bracts glabrous on back, acuminate. Ligulate florets 5–8, with 16–20 mm long and 4–6 mm wide ligule, with 6–8 veins, 3.5–4 times as long as tube; tubular florets numerous (30 and more), with 8.0–9.5 mm-long corolla; limb tubular-campanulate, tube 2.5–3.0 mm long; anthers with very short, acute, basal appendages, filaments with narrow flat antheropodia; style branches long, twisted, obtuse, covered on outside from middle with long, flat hairs, particularly dense below appendage. Achenes 5–6 mm long, narrow, ribbed, sordid stramineous; pappus snow-white, slightly longer than achene. Flowering August to first half of September; fruiting from end of September.

Wet, mainly valley meadows, in forest zone among tall herbs.—*Far East*: Ussuri (southernmost area). *General distribution*: China (northeast, near border with Korea), Korea. Described from Mukden Region (northeast) from Yalu River valley above Sesanpo. Type in Leningrad.

Note. *L. deltoidea* Nakai (loc. cit. 1917), is a closely related species not known to me. Kitamura (l. c.) considers it identical with *L. jaluensis*, along with *L. pulchra* Nakai (loc. cit. 1917). The author of this species himself considered the latter species to be identical with *L. jaluensis* in his more recent work (Nakai, 1952), where, however, he retained the separate status of *L. deltoidea*.

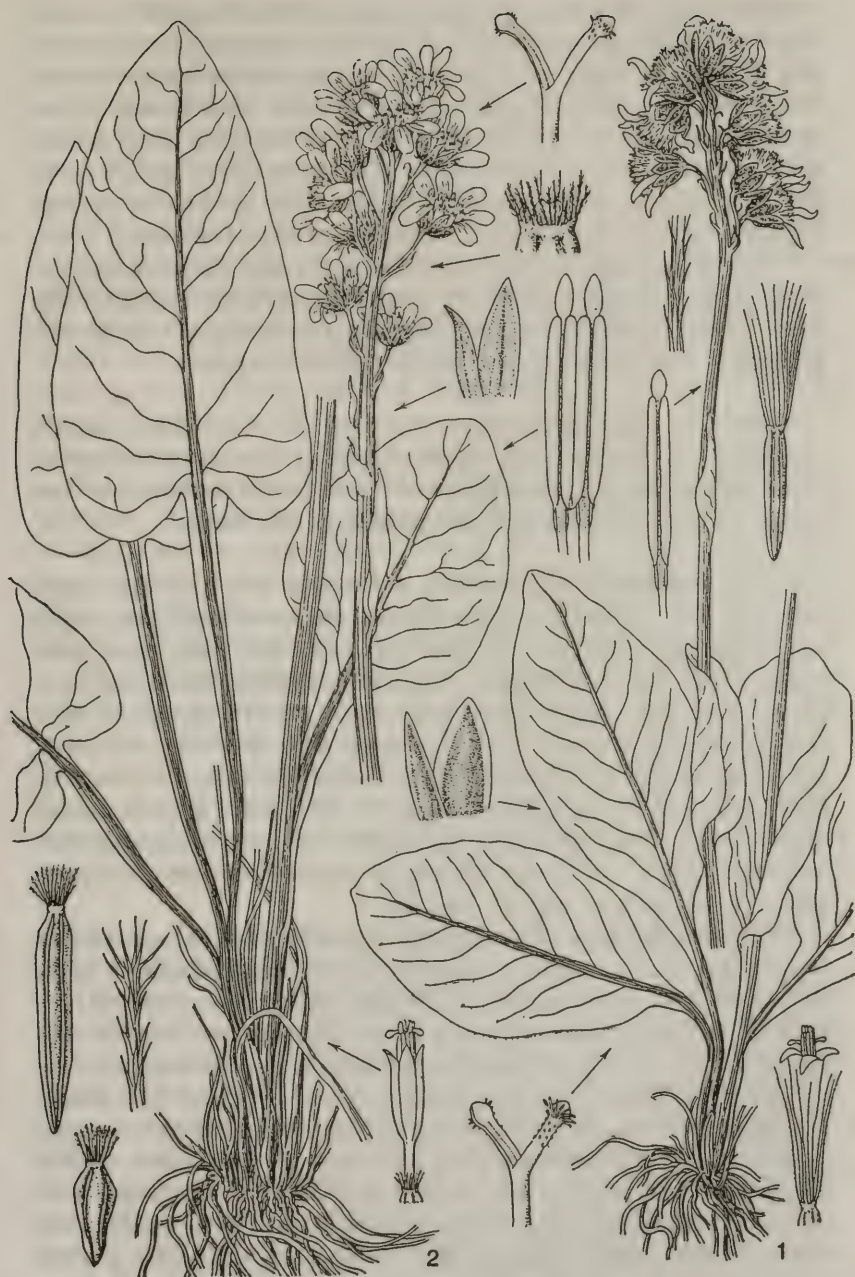
Subsection 3. Paniculatae Pojark. subsect. nova in Addenda, XXV, 893.—Capitula small, mostly in compound paniculate inflorescence; rhizome covered with dense tomentum.

Series 1. Thyrsoidae Pojark. 1. c. 893.—Involucre campanulate or goblet-shaped; lateral branches of panicles usually much shorter than main axis; capitula in racemes; leaves oblong-ovate, with cordate or sagittate base.

A monotypic series.

21. **L. thyrsoida** (Ldb.) DC. Prodr. VI (1837) 315; Kar. and Kir. in Bull. Soc. Nat. Mosc. XIV, 3 (1841) 444; Ibid. XV, 2 (1842) 385; Pojarkova in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII, 298.—*Senecio sibiricus* L. fil. Suppl. (1791) 370; Lepech. in Nov. Acta Petropol. XI, 400; Ldb. Fl. Ross. II, 638; Trautv. in Bull. Soc. Nat. Mosc. XXXII, 2, 58; Franch. in Bull. Soc. bot. Fr. XXXIX, 302; O. and B. Fedtsch. Perech. Rast. Turk. III, 219; Kryl. Fl. Zap. Sib. XI, 2847.—*Cineraria thyrsoida* Ldb. Ic. pl. Fl. Ross. II (1830) 18; Fl. Alt. IV, 107.—**Ic.**: Lepech. op. cit. tab. 9; Ldb. Ic. pl. Fl. Ross. II, tab. 157.—**Exs.**: Fl. alt. exc. No. 93 (sub *Senecio sibiricus* Lepech.).

828 Perennial. Rhizome short, with numerous, rather slender, filiform adventitious roots, densely covered, like stem base, with brownish tomentum and stiff fibrous remnants of dead leaves. Stem 40–125 cm high, 3–10 mm thick in lower part, simple, straight or usually flexuous above, green, sulcate, glabrous or more or less arachnoid-tomentose when young, particularly in upper part. Leaves somewhat thick, concolorous on both sides, glabrous from beginning or initially beneath, uniformly arachnoid-tomentose, usually glabrescent, more or less persistent as scattered floccose tomentum; basal and lower cauline leaves oblong-ovate, less often deltoid, with deeply cordate or almost hastate at base, gradually attenuate upward, acute or sometimes obtuse, sinuate-toothed, with teeth of different forms, from broadly deltoid to lanceolate, long-petiolate, petiole 1.5–2 times as long as lamina; middle cauline leaves with shorter petiole, approximately as long as lamina, usually lanceolate, long-acuminate, with a shallow notch or truncate at base; upper cauline leaves strongly reduced in size, lanceolate-linear to narrowly linear, mostly entire, short petiolate, upper-most leaves sessile. Capitula including ligulate florets 2.5–3.5 mm in dia, at stem apex, (10)12–60, borne in narrow, rather dense panicle, with branches usually much shorter than main axis, or less often, almost as long, bearing 1–4(5); capitula; peduncles (5)7–45 mm long. Involucre campanulate or goblet-shaped, 7–12 mm long and 7–14 mm in dia, with or without 1–2 small bracts at base; involucre bracts, as also peduncles, often floccose-tomentose, later glabrous, only at apex tomentose-floccose; inner bracts ovate or broadly elliptical, with wide scarious border; outer bracts a half as wide as inner, oblong-elliptical, with narrow scarious margin on both or one side. Ligulate florets



5–10(13), with elliptical or oblong, sometimes linear, ligule, 8–14 mm long and (2.5)3–5(6) mm wide; staminodes lacking; style branches long, acute, with short, sparse papilliform hairs on outer side. Tubular florets numerous, with campanulate-tubular limb, 1.5–2.5 times as long as tube and with oblong-deltoid teeth; style branches hairy outside almost from base, and with dense tuft below acute tip. Achenes brownish-yellow, oblong; pappus snow-white, as long as achene. Flowering end of June to July; fruiting from end of August.

831 Wet floodplain and saline meadows, river valleys in shrub thickets, along edges of marshes.—*Western Siberia*: Irtysh, Altai; *Soviet Central Asia*: Lake Balkhash Region, Dzhungaria-Tarbagatai. Endemic. Described from Siberia (from Altai?). Type in London?

Series 2. Songaricae Pojark. op. cit. 893.—Involucre narrow, cylindrical or obconical, green; general inflorescence compound panicle or simple raceme; leaves oblong-deltoid, acute, with cordate base. Two Soviet Central Asian species are included in this series.

22. *L. songarica* (Fisch.) Ling in Contrib. Bot. Inst. Nat. Akad. Peip. II (1934) 532 (excel. synonym.: *Senecio bungei* Fr. and *L. thyrsoides* var. *alpina* Bge.); Pojarkova in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII (1950) 297.—*Senecio songaricus* Fisch. in Fisch. and Mey. Enum. pl. Nov. Schrenk. (1841) 52; Ldb. Fl. Ross. II, 637 (“*songoricus*”); O. and B. Fedtsch. Perech. Rast. Turk. III, 218 (excl. syn. 1, 2, 4 and var. *arachnoideus*; Franch. in Bull. Soc. bot. Fr. XXXIX, 304, p. min. p.; Kryl. Fl. Zap. Sib. XI, 2848.—*S. turkestanicus* Winkl. in Tr. SPb. Bot. Sada, XI (1890) 279.—*S. songaricus* var. *hastifolius* Winkl. in sched.; O. and B. Fedtsch. op. cit. 219, nom. nud.—*lc.*: Pojarkova, loc. cit. Fig. 2.

Perennial. Rhizome short, densely covered with thick, adventitious roots, in upper part tomentose. Stem 40–80 cm high, straight, in upper part sometimes flexuous, sulcate, densely arachnoid-tomentose, later glabrous or floccose-tomentose and below, often reddish. Leaves when young, as also petiole, arachnoid-tomentose, later glabrous; basal and lower cauline leaves with long petiole, at base expanded like sheath, 1.5–2 times as long as lamina, lamina oblong deltoid or oblong-ovate to lanceolate, less often broadly deltoid, with deeply notched, more or less hastate base, acute or less often obtuse, 7–35 cm long and 3.5–25 cm wide, sinuate, irregularly sharp-toothed; middle leaves smaller, with shorter petiole, upper ones strongly reduced, from broadly angular with base truncate to narrowly lanceolate, gradually narrowed into short petiole, partly sessile, sometimes with amplexicaul auricle, entire or with more or less remote teeth, uppermost leaves sometimes narrowly

linear, identical to bracteal leaves. Capitula upright, (30) 60–300, in paniculate inflorescence, (6) 10–40 mm long and 5–25 mm in dia, pyramidal, elongated, with short lateral branches or more or less corymbose if upper branches reach level of main axis; capitula on inflorescence branches in panicle or simple racemes only in their upper part; peduncles of capitula 2–10(17) mm long. Involucre narrow, tubular-cylindrical, unchanged in shape at fruiting, 7.5–9.0 mm long and 4–5 mm wide in dia with 1–3 very small, appressed bracts at base; involucre bracts 5–8, light green, pubescent on back; inner bracts usually oblong-elliptical, with broadly scarious margin; all bracts acute and apically short-ciliate along margin. Ligulate florets bright yellow, 2–4(5), with oblong, 7–10 mm long and 2.5–3.5 mm wide ligule, 2–2.5 times as long as tube, with 4–7 veins, lacking staminodes. Tubular florets 7–12, with 7.5–10.0 mm long corolla; limb narrowly campanulate, about 1.5 times as long as tube, lobed up to a fourth to a third into narrow-deltoid teeth, style branches short, acute, outside covered with somewhat long hairs up to base, longer below apex and in a tuft. Achenes pale yellow, oblong, 4.5–5.0 mm long, somewhat flat; pappus as long as or up to 1.5 times as long as achene, snow-white, very fine hairs, with very short barbs. Flowering second half of June to first half of August; fruiting from second half of August.

Floodplain meadows, scrubs and tall herb thickets along banks of rivers, lakes, and edges of marshes, thickets of cheegrass and reeds, wet saline meadows, mainly in foothills and in steppe Zone.—*Soviet Central Asia*: Lake Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan (only eastern part of Kirgiz Range). *General distribution*: Dzhungaria-Kashgaria (Dzhungaria). Described from Tentek River, in Dzhungarian Alatau foothills. Lectotype and its duplicates in Leningrad.

23. **L. knorringiana** Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XXI (1961) 360, Fig. 1.

Perennial. Rhizome strongly shortened, densely covered with cord-like, thickish, adventitious roots, its upper part, as also stem base, densely covered with slender fibrous remnants of dead petioles and sparse brown tomentum. Stem solitary, erect, 14–40 cm high, slender; about 1.5 mm (less often more) thick in lower part, longitudinally ribbed, rather densely arachnoid-floccose only below inflorescence, but sparsely and irregularly below; often more or less with anthocyanin coloration. Leaves at flowering glabrous on both sides, finely coriaceous when dry, dull, light green, paler beneath, with thin lateral veins distinct on both sides; lowermost leaves crowded in basal rosette and mostly long-petiole, petioles 1.5–2 times as long as lamina, less often as long or slightly shorter, thin, often reddish, sulcate, toward base expanded

833 into thick, veined, coriaceous sheath; lamina 3–8(10) cm long and 2.7–5.0 cm wide, cordate, oblong-cordate, or almost sagittate, short-acuminate or more often long-acuminate, sinuate-small-toothed, only near base coarsely toothed; middle cauline leaves 1–3, lower 1–2 like basal but with shorter petiole; upper cauline leaves 4–9, strongly reduced, narrow, 3.5 cm long and 1.5–2.0 mm wide, oblong or often narrowly linear, entire, finely long-acuminate, lowermost of them petiolate, rest sessile. General inflorescence 3–10 cm long, with (1)3–6(10) capitula, usually in more or less elongated, lax raceme, less often in weakly branched panicle; peduncles slender, arachnoid-hairy, upper 0.8–2.5 cm long, with solitary capitulum, lower up to 5 cm long, sometimes with 2–3 capitula. Capitula upright, including ligulate florets 1.5–2.5 cm in dia. Involucre narrowly campanulate to narrow-obconical, 7–10 mm long and as much in dia, with 1–2 very small setaceous bracts at base; involucre bracts 7–8 (9), more or less densely floccose-tomentose to subglabrous; inner bracts rather broadly elliptical or oblong-obovate, with wide, transparent scarious border; outer bracts narrowly linear or lanceolate-linear, lacking or with very narrow border; all bracts acuminate, short-ciliate and tomentose at apex. Ligulate florets 5–7, with oblong, 11–13 mm-long and 3.0–4.5 mm-wide ligule, with 4–5 veins; tube a half as long as ligule; staminodes usually present. Tubular florets 7–30, with 6.4–7.5 mm-long corolla; tube approximately two-thirds as long as limb; limb narrowly campanulate, lobed up to a third into oblong-deltoid teeth; style branches with a barb of long thickish hairs outside below appendage, but densely covered with thinner and shorter hairs below up to base; basal appendage of anthers very short. Mature achenes unknown; pappus hairs snow-white, as long as corolla of tubular florets. Flowering second half of July to August.

Mountains from forest to alpine zone, up to 3,600 m, in forests, subalpine and alpine meadows, mountain-steppes, open stony and rocky slopes, talus and gravel beds.—*Soviet Central Asia*: Tien Shan (eastern and central parts, Ketmen and Terskei Alatau ranges). Described from eastern Tien Shan from Terskei Alatau Range and in vicinity of the village of Tekes in Tekes River valley. Endemic. Holotype and isotypes in Leningrad.

Note. The closest species to *L. knorringiana* is *L. songarica* (Fisch.) Ling. which, however, is quite sharply distinguished by a number of characteristics: a narrower tubular-obconical (not campanulate-obconical) involucre, with 5–6 (very rarely 7) involucre bracts and not 7–10 bracts; the receptacle with smaller alveolae separated by broad septae; in all, 2–4(5) and not 5–7, relatively short ligulate florets; a larger and more compound, many-headed inflorescence (with up to 300 capitula); and also larger leaves and a taller stem.

Series 3. Thomsonianae Pojark.—Involucre narrowly cylindrical, golden-brown; capitula in compound corymbose panicle, its lateral branches bearing corymbose inflorescences at their ends; leaves roundish-ovate or roundish-deltoid, soft, dark green above.

834 Besides *L. thomsonii*, *L. trigonophylla* Rech. f. from Afghanistan also belongs to this series.

24. ***L. thomsonii*** (Clarke) Pojark. in Spisok. Rast. Gerb. Fl. SSSR, XI (1949) 165 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII (1950) 293.—*L. thyrsioidea* var. *alpina* Bge. Rel. Lehm. in Mém. sav. étr. VIII (1854) 347; Boiss. Fl. or. III, 383.—*Senecio thomsonii* Clarke, Compos. indic. (1876) 205; Hook. f. Fl. Brit. Ind. III (1882) 348; Franch. in Ann. Sc. Nat. 6-me sér. XVI (1883) 313 "*thompsoni*".—*S. bungei* Franch. Ibid. 313.—*S. songaricus* auct. non Fisch. (1841): Franch. in Bull. Soc. bot. Fr. 39 (1892) 304, p. max. p.: O. and B. Fedtsch. Perech. Rast. Turk. III, 218 p. p. (excl. syn. *S. turkestanicus*, *S. songaricus* var. *hastifolius* and partim area).—*S. songaricus* var. *arachnoideus* Winkl. in sched.; O. and B. Fedtsch. ibid., 219, nom. nud.—*L. bungei* M. Pop. in Tr. Uzb. Univ. Nov. Ser. 27, Biol. 14 (1941) 74.—**lc.**: Pojarkova, loc. cit. Fig. 1.—**Exs.**: G. Fl. SSSR, No. 3498.

Perennial. Rhizome short, with few approximate tiers of cord-like adventitious roots, in upper part covered with thick layer of brownish tomentum. Stem 30–200 cm high, up to 18 mm thick in lower part, sulcate-ribbed, often reddish, in younger stage arachnoid-tomentose, later glabrous or floccose-tomentose. Leaves somewhat thick, soft, dark green and lustrous above, lighter beneath, initially entirely grayish, arachnoid-tomentose, very often persisting till end, rarely entirely glabrous; basal leaves mostly 2–3, petiolate, petiole 1.5–2.5 times as long as lamina, basally enlarged into semiamplexicaul sheath, lamina (5) 7–25 cm long and 6–35 cm wide, broadly ovate or roundish ovate or deltoid to strongly expanded-reniform, with sagittate hastate, less often deeply cordate base, with large, mostly roundish lobe at base and with round, less often acute apex, sinuate-sharply toothed to finely toothed, teeth resembling cusp, less often only sinuate or entire; lower 1–2 cauline leaves like basal but usually much smaller and with shorter petiole, upper leaves strongly reduced, of same shape or strongly narrowed, lanceolate, often toothed only in lower part, or all leaves entire, short-petiolate. General inflorescence compound, corymbose panicle, 11–35 cm long and 6–30 cm in dia, arachnoid-tomentose, later often entirely glabrous; branches usually long, mostly bearing compound corymbs at their tips, consisting of few simple, dense corymbs at ends of branches of third order, containing a few capitula crowded on short 2–10(15) mm-long peduncles. Involucre narrowly

835 cylindrical, 8–12 mm long and 3.5–4.0 mm in dia, with 1–3 appressed, narrowly lanceolate, long-acuminate, 3–5 mm long bracts; similar one or few bracts usually also found on peduncles; involucre bracts soon turning brown, lustrous, glabrous, with a tuft of somewhat long hairs only at apex and white-ciliate along margin in upper part; inner bracts oblong- or lanceolate-elliptical, with wide scarious margin; outer bracts two-thirds as wide to almost linear, with very narrow membranous margin; all bracts acuminate; at maturity of fruits bracts stellately squarrose. Ligulate florets 1–3 very rarely 4(5), bright yellow; ligule oblong, less often oblong-elliptical, acute, 12–20 mm long and 3–4 mm wide, with (4)6–8 veins, 3–4 times as long as tube. Tubular florets 7–12, with 7.5–8.0 mm-long corolla; limb narrowly campanulate or almost cylindrical-campanulate, about 1.5 times as long as tube and lobed up to 1/4–2/5 into narrowly deltoid teeth; style branches acute, with dense tuft of hairs outside below apex, and with very short papilliform hairs up to slightly below middle. Achenes 5–6 mm long, narrowly terete, light yellow; pappus snow-white, as long as achene. Flowering first half of June to July; fruiting from end of August.

Upper part of arboreal-scrub vegetation zone in forests, particularly in walnut and maple forests, and in tall herb thickets and also in meadows in subalpine zone where, in places, it is the landscape plant.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian, Alatau), Pamiro-Alai Region (except eastern and western Pamir) and whole of Tien Shan. *General distribution*: Dzhungaria-Kashgaria (Kashgaria). Described from Kashgaria. Type in Kew.

Series 4. Altissimae Pojark.— Involucre tubular-campanulate; capitula aggregated in pyramidal panicle, panicle branches bear capitula at their tips in racemes or small panicles; leaves oblong-ovate, light green, fleshy and thick.

One species.

25. *L. altissima* Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII (1950) 316.— *Ic.*: Pojarkova, *ibid.* Fig. 6.

Perennial. Rhizome short, covered with numerous filiform adventitious roots and with fibrous remnants of dead leaves in upper part. Stem about 2 m high and up to 1.5 cm thick, erect, sulcate-ribbed, glabrous or sparsely floccose-arachnoid-hairy only below. Leaves light green, fleshy, lustrous, glabrous, but initially weakly arachnoid-hairy beneath; basal leaves 2 with thick, up to 0.8 cm thick, not winged petiole expanded into long sheath, their laminae as long as petiole or slightly shorter, 25–39 cm long and 25–30 cm wide, cordate or ovate, with more or less broadly cordate base, somewhat decurrent

on petiole, obtuse, sinuate-toothed, teeth narrowed into short cusp;
 836 cauline leaves 3, reducing towards stem apex, lower among them with
 ovate-deltoid lamina and narrowly winged petiole as long or up to a
 half as lamina; next leaf with short, broadly winged petiole, third leaf
 small, approximately as long as lower bracteal leaf, sessile, entire.
 Inflorescence compound pyramidal panicle up to 100 cm long, with
 numerous lateral branches having bracteal leaves at base, like upper
 cauline leaf in lower branches but smaller, upper branches with narrow,
 lanceolate-linear or linear bracteal leaves, bearing capitula in dense
 pyramidal, elliptical, or capitate panicles only in upper part; lower
 branches 20–45 cm long, widely spaced, generally reduced toward
 apex of inflorescence, coming closer to each other. Capitula erect,
 after anthesis drooping, on peduncles shorter than involucre. Involucre
 tubular-campanulate, 9–10 (11) mm long and as much in dia with 1–
 3 short linear bracts at base; involucre bracts 5–8, dimorphic: inner
 bracts ovate or obovate, with broadly scarious margin; outer bracts
 narrow, lanceolate or almost linear, acuminate and white tomentose-
 ciliate at apex. Ligulate florets (2)3–4, with narrowly obovate, about
 12 mm-long and 4.5–5.0 mm-wide ligule, with 5–7 veins; staminodes
 absent. Tubular florets 10–14, with 9–10 mm-long, corolla; limb
 narrowly campanulate, 5.5–6.5 cm long; anthers with very short basal
 appendages, antheropodia weakly enlarged; style branches conical,
 acute, with dense tuft of somewhat long hairs outside below apex and
 shorter hairs up to middle of branches or slightly below; in ligulate
 florets stylodes only with tuft of hairs below apex. Immature achenes
 brownish, ribbed, 5 mm long; pappus white, slightly shorter than corolla
 of disk florets. Flowering second half of June.

Upper part of tree-scrub zone, on slopes among tall herbs and also
 in subalpine zone.—*Soviet Central Asia*: Pamiro-Alai Region (southern
 slope of Hissar Range, where it is known only from basin of Kondara
 River, tributary of Varzob River). Endemic. Described from Kvak in
 basin of Kondara River. Type in Leningrad.

Section 4. Senecillis (Gaertn.) Kitam. Compos. Japon. III (1942)
 187.—*Senecillis* Gaertn. De fruct. et Sem. II (1791) 453.—Sect.
Cyathcephalum (Nakai) Kitam. op. cit. 185 p. p.; Addenda XXV,
 893.—Capitula mostly small, less often medium-sized, in simple raceme
 or narrow, oblong, compound panicle. Involucre tubular or almost bowl-
 shaped; involucre bracts free or connate in 3- or 4-toothed bowl; pappus
 hairs white, soft, long or short, stiff or brown setaceous; antheropodia
 837 distinctly broader than filament. Style branches with conical appendage.
 Leaves glaucescent, fleshy, succulent or more or less coriaceous.

Type of section: *L. glauca* (L.) O. Hoffm.

Species of eastern Soviet Central Asia and Central Asia, Iran, Siberia and Europe.

Subsection 1. Sericochaetae Pojark. subsect. nova in Addenda, XXV, 894.—Pappus hairs snow-white, soft, long; involucre bracts free; stem hollow; rhizome glabrous.

Type of subsection: *L. macrophylla* (Ldb.) DC.

Series 1. Macrophyllae Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII (1950) 310.—Capitula small, numerous, few-flowered, in oblong-cylindrical or cylindrical-pyramidal panicles; ligulate florets (1)2–6; involucre narrow; involucre bracts 5–8.

This series includes three [sic] Central Asian species. *L. persica* Boiss. (Elburz Range in northern Iran) and *L. afghanica* Pojark. (Afghanistan).

26. ***L. macrophylla*** (Ldb.) DC. Prodr. VI (1837) 316; Kar. and Kir. in Bull. Soc. Nat. Mosc. XIV, 3 (1841) 444; Ibid. XV, 2 (1842) 461; Ldb. Fl. Ross. III, 621; O. and B. Fedtsch. Perech. Rast. Turk. III, 212 (excl. area Tien-schan and Pam.-Al.); Krylov, Fl. Zap. Sib. XI, 2863; Pojarkova in Bot. Mat. Gerb. Bot. Inst. AN SSSR, XII, 310.—*Cineraria macrophylla* Ldb. Fl. Alt. IV (1833) 108.—*Senecio ledebourii* Sch. Bip. in Flora, XXVIII (1845) 50; Franch. in Bull. Soc. bot. Fr. 39 (1892) 302 p. p. typ.—**lc.**: Ldb. Ic. pl. Ross. Alt. IV (1833) tab. 367.

Perennial. Rhizome short, densely covered with thick, cord-like, brown or yellowish-brown adventitious roots, and in upper part with stiff fibrous remnants of dead leaves. Stem (35)100–180 cm high, up to 1.0–1.5 cm thick in lower part, erect, strong, sulcate, covered with yellowish and thickish short hairs below inflorescence and often somewhat below. Leaves light glaucous, thickish, on both sides glabrous or hairy beneath (sometimes rather densely) with hairs as on stem; basal leaves usually 2, on thick petiole, purple like stem in lower part, as long as or 1.5 times as long as lamina or shorter, lamina 9–45 cm long and 4.5–20 cm wide, broadly ovate or oblong-ovate, obtuse or short-acuminate, mostly with truncate or roundish-cuneate base, decurrent on petiole more or less as wide wings, sinuate-toothed; cauline leaves 2–3, lower leaf often like basal or much narrower, with relatively shorter, winged petiole, others strongly reduced, sessile, with amplexicaul base sometimes expanded into auricles. General inflorescence 4.5–40 cm long, compound paniculate, rather dense and pyramidal in upper part, with usually widely spaced, short (2.5–5.5 cm long, less often up to 8–9 cm) branches in lower part, bearing at their ends a panicle or less

often a raceme of densely clustered capitula, only in weaker plants branches absent and inflorescence short, 4.5–7.0 cm long, as dense, cylindrical-pyramidal panicle; bracteal leaves only at base of lower-most branches of inflorescence, 1.0–1.5 cm long, ovate, others small, linear or filiform; peduncles of capitula 1–3 mm long. Involucre 3.5–6.0(8.0) mm long and 2.5–3.0 mm in dia, narrow, tubular or obconical, narrowed toward base with 1–3 small bracteal leaves at base; involucre bracts 5–6(8), firmly contiguous at anthesis and up to dehiscence of fruits; inner bracts obovate, obtuse, with wide scarious margin; outer bracts oblanceolate, obtuse or lanceolately acute, with narrow scarious margin; all bracts glabrous or hairy on back and with ciliate margin in upper part. Ligulate florets (1)2–3, with elliptical, 5.5–9.0 mm-long ligule with 4–6 veins; tube 3–5 mm long. Disk florets 4–7, with oblong-campanulate limb; tube as long as limb or slightly shorter; anthers with short basal appendages, filaments with weakly enlarged antheropodia; style branches short-pointed, usually only with tuft of short hairs outside at base. Achenes yellowish-brown, 3.5–4.0(5.5) mm long, angular, finely ribbed; pappus white, almost as long as corolla of tubular floret. Flowering second half of June to July; fruiting second half of July to August.

Wet, including marshy and saline meadows, herb thickets around sources of springs, shrub thickets in valleys, edges of forests and glades in lower and middle mountain zones and particularly in Kazakh low volcanic hills.—*Western Siberia*: Irtysh (extreme south), Altai (southwest Chingistal steppe); *Soviet Central Asia*: Lake Balkhash Region (in the lower mountain volcanic cones), Dzhungaria-Tarbagatai, Tien Shan (Karatau Range, foothills of Talass Alatau and Tersk Range in western Tien Shan). *General distribution*: Dzhungaria-Kashgaria (Dzhungaria). Described from Chingistai steppe (northeastern part of Kazakhstan). Type in Leningrad.

27. **L. heterophylla** Rupr. in Mém. Acad. Sc. Pétersb. VII, ser. XIV, 4 (1869) 53 p. p. (saltem quoad var. *thyrsoides* and excl. pl. Schrenk.); O. and B. Fedtsch. Perech. Rast. Turk. III, 212 p. p. (quoad pl. tiench.).—*Senecio ledebourii* auct. non Sch. Bip (1837): Franch. in Ann. Sc. Nat. 6-me ser. Bot. XVI (1883) 313 (excl. synonym.); in Bull. Soc. bot. Fr. 39, 302 p. p. (quoad pl. turkest.).—*L. persica* auct. fl. turkest. non Boiss. (1845): Lipsk. Gorn. Bukhara I (1902) 128, 129, 142, II (1902) 420, 441, 480, 531 p. p.; O. and B. Fedtsch. op. cit. 212; Pojarkova in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII, 311 p. p.—*L. macrophylla* auct. fl. turkest. non DC. (1837); O. and B. 839 Fedtsch. op. cit. 212 p. p.—*lc.*: Pojarkova, loc. cit. Fig. 3.

Perennial. Plant from 22 (in alpine zone) to 200 cm high; rhizome like in previous species. Leaves thick, succulent, glaucous, on both

sides glabrous or with thickish hairs beneath; basal leaves 2, usually with elliptical or oblong lamina, 7–52 cm long, pointed at apex and with cuneate base, decurrent as wings on petiole, less often ovate, with truncate or notched base, petiole a half as long as lamina or almost twice times as long, sinuate-toothed, often with narrow sharp teeth; lower cauline leaf like basal but with shorter petiole, upper leaf (sometimes 2) much smaller, elliptical or ovate, sessile, often entire. Inflorescence compound, mostly cylindrical, less often narrow-pyramidal panicle, more or less dense in upper part, spicate, cylindrical and often longer than lower part, with more or less numerous, widely spaced, 1.5–5.0(8) cm-long branches, bearing capitula from middle or less often almost from base in dense, sparsely branched panicles or spicate racemes, size and degree of branching of inflorescence strongly variable; in short plants from higher altitudes inflorescence 4–7 cm long, weakly branched, almost racemose (*L. heterophylla* β . *subramosa* Rupr. p. p. 1.c.—*L. macrophylla* var. *minor* Winkl. in sched.—*Senecio ledebourii* β . *minor* Franch.), in robust tall plants of forest zone up to 60 cm long with numerous remote branches (*L. heterophylla* γ . *thyrsoides* Rupr.); stem below inflorescence, its branches and peduncles usually more or less very densely covered with thickish yellow hairs; bracteal leaves at base of lower branches of inflorescence small and narrow, narrowly lanceolate, long-acuminate, up to 30 cm long, others very small, more or less linear to filiform; involucre campanulate, 6–9 mm long and 5–8 mm in dia with 1–3 filiform bracteal leaves at base; involucre bracts 6–8; inner bracts broadly elliptical or ovate, obtuse or short-acuminate, with wide scarious margin; outer bracts narrow, elliptical or lanceolate, with narrow scarious margin, usually long-acuminate; all bracts floccose in upper part along margin, glabrous to densely hairy on back; after flowering involucre bracts distinctly squarrose, becoming broader. Ligulate florets (3)4–5, with elliptical or oblong 8–10 mm long ligule; tube 3.0–5.5 mm long. Tubular florets (7)10–14(16), 12–14 mm long, with narrowly campanulate or narrowly conical limb, more or less gradually narrowed into short (2–3 mm long) tube; style branches with subacute apical appendage, with tuft of long hairs outside at base and shorter hairs below, sometimes up to base of branches. Achenes 5–7 mm long and 1.0–1.5 mm wide, light brown. Flowering May to first half of August; fruiting July to September.

Upper part of forest zone in cut-over forests, edges in forest glades, scrubs with tall herbs and subalpine and alpine zones under adequate moisture conditions.—*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau), Pamiro-Alai (not throughout Pamir, in Trans-Alai, Nuratau, Kuramin and apparently Turkestan ranges), Tien Shan (Chatkal, Fergana ranges and outer, central and eastern Tien Shan

mountains). *General distribution*: Dzhungaria-Kashgaria. Described from central Tien Shan. Type not preserved.

Note. The Central Asian plants of this species were described by Ruprecht under the name *L. heterophylla* var. *thyrsioidea* Rupr. from the materials of Osten-Sacken. At the same time, Ruprecht described two more varieties of his species: var. *alpina*, which, apparently, should be referred in part to *L. alpigena* Pojark., and var. *subramosa* Rupr., whose taxonomic status is not quite clear to me; from their brief descriptions, they can be referred both to *L. heterophylla* Rupr. s. str. and to *L. alpigena*. Using the precedent of the author who, for the first time, split off the species, I selected var. *thyrsioidea* as the type of *L. heterophylla*, considering it as a Tien Shan-Pamiro-Alai race of the series *Macrophyllae*.

L. heterophylla should be distinguished from *L. persica* Boiss., with which I earlier combined it. *L. persica* has denser pubescence and a denser inflorescence with very short branches (the lower branches mostly are shorter than the middle ones) bearing rather tightly clustered capitula from the base itself.

28. ***L. talassica*** Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII (1950) 311.

Perennial. Rhizome short, densely covered with brown fibrous roots, with fibrous remnants of dead leaves in upper part. Stem 45–100 cm high, 3–8 mm thick, erect, sulcate-ribbed, usually more or less purple below, glandular-hairy only below inflorescence, glabrous below. Leaves glaucous, succulent, glabrous; basal leaves three (four), outermost [lowermost] considerably shorter than other 2–3 leaves, uppermost with 14–32 cm-long and 9–15 cm-wide lamina, oblong-ovate or elliptical, sinuate or sometimes indistinctly toothed, obtuse or, less often acute, with roundish-cuneate or cuneate base, more or less decurrent, petiole often winged almost entirely, up to 2/3 as long or as long as lamina, expanded at base, semiamplexicaul; cauline leaves usually 3, lower of them slightly above base of stem, sometimes as long as inner [upper] basal leaves but with shorter petiole, usually 2 lower cauline leaves oblong or oblong-elliptical, narrowed in lower third and then expanded below, broader part being winged petiole, 841 whose base decurrent over short distance, and often auriculate below; upper cauline leaf strongly reduced, ovate or oblong, with or without constriction, sessile, often entire; upper bracteal leaf in shape and size often like upper cauline leaf, others small, narrowly lanceolate to filiform. Capitula in elliptical, narrowly pyramidal or cylindrical panicle, 11–30 cm long, almost spicate-racemose in upper part, with short, 1–5(6) cm long-branches below bearing spicate racemes; peduncles of

capitula 2–5(7) mm long; capitula including ligulate florets 22–30(35) mm in dia. Involucre campanulate and campanulate-bowl-shaped lower 8 mm long, others 9–12 mm long, 8–12 mm wide at flowering with 3–5 linear or filiform bracteal leaves at base; involucre bracts (5)6–8; inner bracts ovate or obovate, with wide scarious margin; outer bracts lanceolate or linear, with or without narrow scarious margin; all bracts more or less glandular-hairy on back and along margin, apically tomentose. Ligulate florets 4–6, fertile, usually with staminodes, with oblong or linear ligule, (1.5)2–3 times as long as tube. Disk florets 12–20, with 8.0–9.5 mm-long corolla, limb narrow-campanulate, tube 2–3 mm-long; anthers with subacute basal appendages, antheropodia weakly enlarged; style branches conical, acute, with a dense tuft of long hairs outside below apex and scattered hairs below almost up to middle. Achenes 6–7 mm long, light-colored; pappus white, almost as long as achene. Flowering July to first half of August.

Meadow slopes, banks of mountain streams from upper part of tree-scrub zone to beginning of alpine zone.—*Soviet Central Asia*: Tien Shan (western part—Talass Alatau). Endemic. Described from the upper reaches of Ak-Su River in Talass Alatau. Type in Leningrad.

Series 2. *Alpigenae* Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII (1950) 313.—Capitula in simple, usually dense, often spicate racemes, less often lower peduncles bearing 2–3 capitula; involucre campanulate-goblet-shaped or almost goblet-shaped, with 7–12(14) involucre bracts.

Besides our species, this series also includes *L. tangutorum* Pojark. (*L. potanii* Pojark. non Ling (1937) from central China.

842 29. ***L. alpigena*** Pojark. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII (1950) 313.—*L. heterophylla* α . *alpina* Rupr. and β . *subramosa* Rupr. in Mém. Acad. Sc. Pétersb. VII, sér. 4 (1869) 59 p. p.—*L. altaica* auct. fl. turkest. non DC. (1837); O. and B. Fedtsch. Perech. Rast. Turk. III, 211 p. p. (quoad pl. tiansch. et pamiroalaic.)

Perennial. Rhizome strongly reduced, densely covered with cord-like, rather slender or thickish, adventitious roots, with dense thin fibrous remnants of dead leaves in upper part. Stem 10–40(75) cm high, erect, sulcate, basally purple, glabrous, only below inflorescence (as also peduncles) more or less densely covered with yellowish, flat, multi-cellular, flexuous hairs and often also with white, fine, arachnoid hairs. Lowermost 1–2 leaves scaly, others dark glaucous or green, lighter beneath, somewhat thick, succulent, glabrous on both sides or rather densely hairy beneath, with short, thickish, multicellular hairs; basal and lower cauline leaves 5–25 cm long (excluding petiole) and

2–10 cm wide, with lamina of different forms from broadly ovate and broadly elliptical to lanceolate, obtuse or more or less acuminate, with truncate or often cuneate base, decurrent on petiole, entire or often, at least some, with small, mostly remote teeth, often reduced to small callous cusp, petiole a third to a half as long as lamina, glabrous, mostly purple, winged entirely or only in upper part; middle and upper cauline leaves sessile, amplexicaul, elliptical or oblong-obovate, lower leaves large, upper strongly reduced. Inflorescence 2–11 cm long, with 5–20 capitula, usually in rather dense, spicate, ovoid raceme, often lower peduncles branched bearing 2–3(5) capitula; peduncles of capitula 2.5–7.0 mm long. Capitula including ligulate florets 1.0–2.2(3.0) cm in dia, drooping after anthesis. Involucre bowl-shaped or campanulate-bowl-shaped, less often campanulate, with 1–3 linear or almost filiform bracts at base; involucre bracts 8–12(7–14), on back more or less densely covered with yellowish flexuous hairs, short-ciliate in upper part, along margin, (7)8–11 mm long, distinctly dimorphic: inner bracts much broader than outer ones, ovate and with wide scarious margin; outer bracts lanceolate, often without scarious margin or with scarious border on one or both sides; all bracts acuminate. Ligulate florets 7–12, with obovate or linear ligule 6–8(12) mm long, about 2 times as long as tube and with 4–6 veins. Tubular florets numerous, up to 30(40), with 6.5–8.0 mm-long corolla; limb weakly enlarged, narrowly campanulate, almost tubular, roughly 2 times as long as tube; anthers with narrow, lanceolate, acuminate apical appendages and short basal appendages filaments in upper part enlarged into antheropodia; style branches short, with conical, somewhat broadened appendage, with a tuft of small hairs outside at its base and with very short hairs below. Achenes brownish-yellow, 5.0–5.6 mm long and 1.5–1.7 mm wide; pappus somewhat longer than achenes. Flowering second half of June to first half of August; fruiting from September.

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Alpine (up to 3,600 m) and subalpine zones on meadow and stony slopes, in juniper forests, and in Tien Shan in spruce forests.—*Soviet Central Asia*: Pamiro-Alai (Trans-Alai, Alai ranges, eastern and western Pamirs, Darvaz, Karategin, Peter the First ranges and western part of Hissar Range—in basin of Sardai-Mion River), Tien Shan, western (Fergana, Chatkal, Tashkent ranges, Angren Plateau), central and eastern. *General distribution*: Dzhungaria-Kashgaria (Kashgaria and Dzhungaria—Borokhoro Range). Described from south of Pamirs from Mats River. Type in Leningrad.

30. *L. altaica* DC. Prodr. VI (1837) 315; Bong. and Meyer, Suppl. fl. Alt. (1841) 149; Ldb. Fl. Ross. II, 621, (excl. synonym. Linn. Gmel. and area praeter Altai); O. and B. Fedtsch. Perech. Rast. Turk. III, 211

p. p. (excl. pl. tiansch. pamiroal.); Kryl. Fl. Zap. Sib. XI, 2865; Pojarkova in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XII, 313.—*Senecillis glauca* auct. non Gaertn. (1791); Ldb. Fl. Alt. IV (1833) 113 (excl. synonym).—*Cineraria altaica* C.A.M. ex DC. loc. cit. nom. in synonym.—*Senecio altaicus* Sch. Bip. in Flora, XXVIII (1845) 50; Franch. in Bull. Soc. bot. Fr. 39 (1892) 292 (excl. pl. e Kansu).—*L. glauca* var. *altaica* Kryl. Fl. Alt. III (1904) 664.—Exs.: P. Smirn. Fl. alt. exs. No. 94.

Perennial. Rhizome short, with numerous slender, filiform fibrous roots, in upper part densely covered with fibrous remnants of dead leaves. Stem usually solitary, glaucous or reddish, glabrous or inflorescence including peduncles covered with rather small, papilliform hairs, 10–65(80) cm high. Leaves glaucous, always glabrous on both sides and entire; basal leaves and leaves of sterile rosettes with their lamina elliptical or less often oblong or ovate, 4–18 cm long, 1.5–9.0 cm wide, decurrent on petiole, their petioles as long as lamina or up to two thirds as long, in leaves of sterile rosettes thickened toward base, not winged, in basal leaves usually winged throughout, amplexicaul; cauline leaves 3–4, lower leaves identical with basal leaves, others strongly reduced; all leaves sessile, semiamplexicaul. Inflorescence with 5–25 capitula, usually aggregated in dense spicate raceme, simple or lower peduncles bearing 2–3 capitula, very rarely as elongated lax raceme. Capitula drooping after flowering, 2.5 (3.0) mm in dia (including ligulate florets), with 3–10 mm-long peduncles, arising from axils of narrowly linear bracts usually shorter than peduncles. Involucre campanulate-bowl-shaped or campanulate, 5–9 mm in dia in upper part, often with 1–2 small bracts at base; involucre bracts 6–10
844 mm long, 7–9, dimorphic, usually distinctly in 2 whorls; inner bracts ovate, with wide scarious margin; outer bracts lanceolate, often lacking border; all bracts acuminate, finely floccose at apex, on back always glabrous. Ligulate florets 4–5, obovate, with 8–10 mm-long and 4–6 mm-wide ligule, with 4–7(8) veins. Tubular florets (8)10–20; limb narrowly campanulate; somewhat longer than tube; stamens with basal appendages of anthers very short, filaments flat, thickened above in antheropodia; style branches short, with conical appendage, with a tuft of short hairs outside at its base and much shorter hairs below sometimes up to very base of branches. Achenes 4.5–5.5 mm long and 1.5–2.0 mm wide; pappus white, slightly longer than achene. Flowering end of May to August; fruiting from August. (Plate XXXIX, Fig. 1).

Alpine zone to upper part of forest zone, mostly in meadows and along river valleys and streams.—*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai (Tarbagatai, Saur, Dzhungarian Alatau mountains). *General distribution*: Mongolia, northwestern part



(Mongolian Altai, region of Lake Ubs). Described from Kurchum River in Altai. Holotype in Paris; isotype in Leningrad.

Subsection 2. *Senecillis* (Gaertn.) Pojark. op. cit. 894.—*Senecillis* Gaertn. De fruct. II (1791) 453, tab. 173 p. p.—Capitula in simple, usually dense, spicate racemes, less often with lower peduncles bearing 2–3 capitula. Involucre broadly campanulate or bowl-shaped; involucre bracts 7–12, pappus hairs very short, 0.5–2.0 mm long, stiff, angular-barbed. Stems hollow.

Type of subsection: *L. glauca* (L.) O. Hoffm.

Note. The two rather similar species belonging to this subsection are characterized by a very short pappus, and, on this basis, *L. glauca* was split off into the separate genus *Senecillis* Gaertn., whose independent status is even now recognized by a number of authors. However, I am not inclined to attach much taxonomic significance to this character, because it is observed even in certain species that are not at all related to each other (*L. jacquemontiana* (Decne) Kitam., *L. angusta* (Nakai) Kitam). As regards our species of subsection *Senecillis*, they are undoubtedly closely related to the species of series *Alpigenae*, which is manifest not only in their habit but also in the structure of all floral parts except the pappus (cf. Plate XXXIX), whereas their links with *L. angusta* and particularly with *L. jacquemontiana* are rather distant.

- 847 31. ***L. glauca*** (L.) O. Hoffm. Pflanzenfam. IV (1897) 288; Kryl. Fl. Zap. Sib. XI, 2864.—*Cineraria glauca* L. Sp. pl. ed. 2 (1763) 1242.—*Senecillis glauca* Gaertn. De fruct. et sem. II (1791) 413; DC. Prodr. VI, 313 (excl. area Podolia).—*Senecio senecillis* Maxim. in Mélang. biol. XI (1883) 243; Franch. in Bull. Soc. bot. Fr. 39, 291 p. p. (quoad pl. alt. and excl. var. *carpatica*).—*L. glauca* var. *typica* Kryl. Fl. Alt. III (1904) 664.—**lc.**: Gaertn. op. cit. tab. 173, fig. 4.

Perennial. Plant glaucous, glabrous; rhizome short, with numerous slender, filiform, fibrous adventitious roots and in upper part densely covered with fibrous remnants of dead petioles. Stem erect, 50–150 cm high, (3)4–10 mm thick at base, ribbed, often reddish-violet as also petioles, below inflorescence sometimes including peduncles covered with papilliform hairs. Leaves succulent, always with entire cartilaginous margin; basal leaf and sometimes lower cauline leaf petiolate, petiole as long or up to 1.5 times as long as lamina, their laminas oblong or ovate, obtuse or acute, with truncate-sinuate or cordate, less often almost hastate base, decurrent on petiole, 7–24 mm long and 4–13 mm wide, much smaller in lowermost leaf than in others; cauline leaves oblong-ovate or broadly ovate, lower 1–2 leaves with petiole usually

broadly winged others sessile, semiamplexicaul, upright, upper leaves strongly reduced, often lanceolate. Capitula (8)10–20, mostly in dense ovoid or less often elongated racemose inflorescence; in the latter case, usually with few, rather remote capitula, elongated after flowering, peduncles 7–10(12) mm long, up to 5 cm in lower capitula, lower peduncles sometimes bearing 2–3 capitula; bracteal leaves lanceolate-subulate, shorter than peduncles. Involucre bowl-shaped, 8–10(12) mm in dia in upper part, after fruiting stellate, with 1–3 small bracts at base; involucre bracts 10–12(15), 5–8(11) mm long, often dimorphic. Ligulate florets 7–12, with bright yellow, elliptical-oblong ligule, 8–15(20) mm long and 4–7 mm wide, with 4–6 veins; tube a fourth to a third as long as ligule. Tubular florets 18–29, with 7–8 mm-long corolla; limb campanulate, 5 mm long and lobed into oblong-deltoid, 1 mm long teeth, but abruptly narrowed below into short narrow tube; anthers with narrowly acute apical appendages and short, subacute basal appendages, antheropodia rather wide; style branches acuminate and outside covered with short hairs only in upper part. Achenes yellowish-brown, 4–8 mm long, terete or somewhat cuneate, narrowed toward base, angular, with 5–6 ribs; pappus caducous, of very short, 0.5–2.0 mm-long, thickish hairs, with dense barbs. Flowering second half of June to July; fruiting from August. (Plate XXXIX, Fig. 2).

In floodplain and dry valley meadows, open birch and larch forests.—*Western Siberia*: Ob River Area (southeastern part). Irtysh (east), Altai, Angara-Sayans (western part). Described from Western Siberia. Type in London.

32. **L. carpatica** (Schott, Nym., and Kotschy) Pojark. comb. nova.—*Senecillis carpatica* Schott, Nym., and Kotschy, *Analect. bot.* (1854); Schur. *Enum. pl. Transsilv.* 342 (excl. syn.).—*Senecillis glauca* auct. non Gaertn. (1791) nec Ldb. (1833): Bess. *Enum. pl. Volhyn.* (1822) 76; DC. *Prodr.* VI, 313 p. p. (quoad pl. Podol. and excl. synon); Knapp. *Pflanz. Galiz.* 132 (excl. synon. Linn.); Schur. *Sert. fl. Transsilv.* 41; *Enum. pl. Transsilv.* 342; Katina, in *Vizn. Rosl. URSR*, 552.—*Senecillis glauca (podolica)* Schott. Nym. Kotschy, op. cit. 5.—*Senecillis glauca* var. *transsilvanica* Schur. op. cit. (1866) 342, nom. in synon.—*Senecillis heterophylla* Schur. *ibid.*, nom. in synon.—*Senecio senecillis* auct. non Maxim. (1883); Franch. in *Bull. Soc. bot. Fr.* 39 (1892) 291 p. p. (excl. pl. sibir.); Schmalh. *Fl. Sred. i Yuzhn. Ross.* II, 84.—*Senecio senecillis* var. *carpatica* Janka ex Franch. op. cit. 291.—*Lingularia glauca* ssp. *carpatica* Heyek. *fl. III* (1923) 145.—*Senecillis f. carpatica* Javorka, *Magyar fl. Pflanzendecke Oesterr.-Ung.* I (1945) 420.—*lc.*: Reichb. *lc. Fl. Germ.* XVI (1853) tab. 958; Hayek, loc. cit. fig. 238; Javorka, *Iconogr. fl. Hung.* (1934) tab. 533, fig. 3821.

Perennial. Distinguished from *L. glauca* (L.) O. Hoffm. by toothed margins of all or only lower leaves as also by corolla of disk florets with narrower limb and shorter tube and also by large number of veins (6–10) on ligules of peripheral florets. Flowering July; fruiting September.

Forest edges, herb slopes.—*European part*: Middle Dnieper (Podolia, Pantalikh steppe near Trembovl). *General distribution*: Central Europe (Transylvanian Mountains). Described from Transylvanian mountains, Rodna District. Type not known.

Note. I had an opportunity to become familiar with *L. carpatica* on the basis of two specimens (flowering and fruiting) from Besser's herbarium. Both specimens differ sharply, by their sinuate-toothed leaves and narrow limb of the tubular florets, from the numerous specimens of the western Siberian species *L. glauca* (Gaertn.) O. Hoffm. examined by me.

In describing this species for the first time on the basis of material from the vicinity of Rodna in Transylvania under the name *Senecillis carpatica* Schott, Nym. et Kotschy, the authors contrasted it with the Podolie golden-ray, which they mistakenly identified with *Senecillis glauca* Gaertn. As the basic differences of the Transylvanian plant from the Podolie plant, the following were mentioned: the absence of a cartilaginous margin of the leaves (which has not been confirmed by more recent studies), usually smaller and often simple racemose inflorescences, a narrower ligule of the peripheral florets with fewer (not 8–10 but 6–7) longitudinal veins, and also narrow, almost linear-fusiform (and not cuneate) achenes. Judging from the data of Schur
849 (1866), who cited two species, *Senecillis carpatica* and "*S. glauca*" (which is, in fact, the same as *S. carpatica*), with detailed descriptions for Transylvania, including for Rodna), there is no basis to attach special significance to the above-mentioned differences. This presumption is indirectly supported by the examination of extensive herbarium material of the vicariant species *L. glauca* (Gaertn.) O. Hoffm., which revealed similar parallel variation in this species of the above-mentioned organs, as was indicated for the plants from Transylvania.

Subsection 3. Stereochaetae Pojark. op. cit. 894.—Involucral bracts free or fused into 3–4-toothed cup; pappus hairs brown, stiff, shorter than tubular florets; capitula small, borne in dense oblong panicles. Stems solid; rhizome hairy.

Type of subsection: *L. mongolica* (Turcz.) DC.

Species of the eastern border of Eastern Asia.

Series 1. Mongolicae Pojark. *ibid.*—Involucral bracts free; pappus 3–7 mm long.

Besides our species, this series includes *L. fauriei* (Fr.) Koidz. (Korea) and *L. taquetii* (Lévl. and Vaniot) Nakai (Quelpart[Chuju] Island).

33. ***L. mongolica*** (Turcz.) DC. Prodr. VI (1837) 315; Korshinski in Tr. SPb. Bot. Sada, XII, 357; Kom. Fl. Manchzn. III, 819; Hand.-Mazz. in Engl. Bot. Jahrb. LXIX, 1, 121; Kitag. Lineam. fl. Manshur. 458.—*Cineraria mongolica* Turcz. in Bull. Soc. Nat. Mosc. V (1832) 199.—*Senecio mongolicus* Sch. Bip. in Flora, XXVIII (1845) 50; Maxim. in Bull. Soc. Nat. Mosc. LIV, 1, 28; in Mélang. biol. XI, 242; Franch. in Bull. Soc. bot. Fr. 39, 292.—*Senecio putjatae* Winkl. in Tr. SPb. Bot. Sada, XIV (1895) 125.—*L. putjatae* Hand.-Mazz. op. cit. 120.

Perennial. Plant entirely glabrous, smooth, glaucous, 50–100 cm (and probably more) high; rhizome short, covered with numerous, thick, cord-like, adventitious roots but very densely covered in upper part with fibrous remnants of leaves and together with stem base pubescent with weakly flexuous hairs. Stem solitary, 3.5–4.5 mm thick at base, solid, basally mostly purple. Leaves fleshy, when dry usually rather thick, with very distinct network of veins beneath; basal and sometimes lowermost cauline leaf, as also leaves of sterile rosette, long-petiolate, petioles as long as lamina or slightly longer, reddish at base and with narrow sheath, lamina oblong-ovate, less often ovate or oblong, obtuse or subacute, with roundish-truncate or cuneate base, decurrent on petiole; cauline leaves 2–3, lower leaves identical to basal, other leaves oblong, sessile, amplexicaul or lower leaves with short, broadly winged
850 petiole, uppermost leaves strongly reduced. Inflorescence 2–8 cm long, as dense spicate, ovoid or cylindrical elongated raceme, sometimes with 1–2 remote capitula; peduncles thick, 2–3 mm long, lower up to 1 cm long, borne in axil of narrow, lanceolate-subulate bracteal leaves as long as capitula, lower peduncles sometimes bearing 1–2 similar bracts. Involucre cylindrical, 9–12 mm long, lacking bracts at base; involucral bracts 5(6), dimorphic, in 2 distinct whorls; inner bracts oblong-obovate, obtuse or subacute, with wide scarious margin; outer bracts almost a half as long, acuminate, with very narrow scarious margin on one or both sides; all bracts hairy in upper part along margin and at apex with thickish hairs. Ligulate florets (1)2–4, with golden-yellow, oblong, 13–20 mm-long ligule, with 8–10(12) veins; tube a half as long as ligule. Tubular florets 6–8, with narrowly campanulate limb lobed almost up to middle into narrowly deltoid teeth; tube approximately as long as limb; pappus as long as corolla; anthers with

subacute basal appendages, filaments of stamens thickened in upper part; style branches long and slender, with very short conical appendage, rather densely hairy from base of this appendage to very point of bifurcation of style with long flattened hairs. Achenes almost fusiform, grayish-brown, 4.0–5.5 mm long and 1.5 mm wide, with 5 weakly developed ribs; pappus of thickish, reddish-brown hairs, with frequent barbs such that hairs appear almost plumose. Flowering June to first half of July; fruiting from July (Plate XL, Fig. 1).

Meadows.—*Far East*: Zeya-Bureya (one locality known near the village of Konstantinovka-on-Amur). *General distribution*: China, northeastern part in Greater Khingan, Inner Mongolia—in vicinity of Kalgan and Hubai Province west of Peking. Described from southern part of Inner Mongolia, from vicinity of Boroldzhi. Type and isotype in Leningrad.

Series 2. Schmidtianae Pojark.—*Cyathocephalum* Nakai in Bot. Mag. Tokyo, XXIX (1915) 11.—Involucral bracts fused into goblet with 3–4 lobes; pappus 2.5–4.5 mm long.

Besides *L. schmidtii* (Maxim.) Nakai, the Japanese species *L. angusta* (Nakai) Kitam. must also be included in this series.

Note. I agree with Kitamura (Kitamura, *Compos. Japon.* III, 185) that fusion of the involucral bracts cannot be a criterion for separating the above-mentioned two eastern Asian species into an independent genus. In the subtribe *Senecioninae*, partial fusion of the involucral bracts is observed also in certain species of the genus *Cremanthodium*.

34. *L. schmidtii* (Maxim.) Makino in Bot. Mag. Tokyo, XVII (1903) 191 (quoad typ. excl. specim.); Kom. Fl. Manchzh. III (1907) 697; Kom. and Alis. Oprod. Rast. Dalnevost. Kr. II, 1053; Kitag. Lineam. fl. Mansh. 458; Kitam. Compos. Japon. III, 186.—*Senecillis schmidtii* Maxim. in Bull. Acad. Sc. Pétersb. XVI (1871) 222 (in Mélang. biol. VIII, 16) p. p. (quoad. specim. Schmidt.).—*Senecio schmidtii* Franch. and Sav. Enum. pl. jap. I (1875) 246 (quoad typ., excl. specim.); Forb. and Hemsl. in Journ. Linn. soc. XXIII, 457; Franch. in Soc. bot. Fr. 39, 291 p. p. (quoad. pl. Mandsh.).—*Cyathocephalum schmidtii* Nakai in Bot. Mag. Tokyo, XXIX (1915) 11.

Perennial. Plant glabrous, smooth, glaucous, up to 1–2 m high; rhizome short, thick, densely covered with thick, cord-like, adventitious roots, similarly densely covered in upper part with soft, fibrous remnants of dead leaves, pubescent with simple flexuous hairs. Stem sulcate, 2.5–7.0 mm thick at base, solid. Leaves fleshy, dry, rather thick, with prominent veins beneath; basal leaves long-petiolate, lamina 10–30 cm

long and 5–22 cm wide, broadly ovate to oblong, obtuse or short-acute, with truncate or cuneate base, decurrent as wing mostly only on upper part of petiole, more or less irregularly sinuate-toothed, less often only undulate; cauline leaves oblong and oblong-ovate, lower sometimes with short, broadly winged petiole, others sessile, amplexicaul, adpressed to stem and upright, uppermost leaves strongly reduced, small. Raceme at anthesis condensed, (3)6–13(18)[cm] long, sometimes, including remote lower capitula, up to 23 cm long, simple, less often with lower peduncles bearing 2–3 capitula; peduncles 10–15 mm long, lower 12–15 mm long, in remote lower capitula up to 4(7) cm long, elongating after flowering and raceme becoming lax; lower bracteal leaves small, with peduncles many times as long and usually fused with them over considerable part, others not developed. Involucre green, campanulate, fused, much broader at fruiting, bowl-shaped, with 3–5 teeth or lobes, obtuse or subacute, often with 2 very small short-pubescent teeth at apex. Ligulate florets 3–6, with bright yellow ligule, 13–22 mm long and 2.2–6.0 mm wide, with 6–8 veins, tube a fourth as long as ligule. Tubular florets 12–22, with 7–10 mm-long corolla; limb campanulate, 5–7 mm long, lobed up to a fifth into narrowly deltoid teeth and abruptly narrowed into short, narrow, 2.5–3.0 mm-long tube. Pappus 3.0–4.5 mm long, somewhat longer than corolla tube; anthers with narrow, acute, apical appendages and very short basal appendages, filaments with narrow antheropodia; style branches somewhat long, narrow, attenuate, outside up to point of bifurcation covered with flat hairs. Achenes almost terete, slightly narrowed at tip, ribbed, grayish-brown, 7–8 mm long; pappus dirty reddish-brown, a half as long as achene, consisting of stiff hairs with dense short barbs.

852 Flowering second half of June to July; fruiting September (Plate XL, Fig. 2).

Meadow slopes, in scrubs, open, oak forests, wet and open places.—*Far East*: Ussuri (southern district). *General distribution*: China, northeast (southern part), Korea. Described from Posjet in Ussuri. Lectotype in Leningrad.

Section 5. Glossophyllum Pojark. sect. nova in Addenda, XXV, 894.—Capitula 1–3, with more or less distinctly 2 whorled involucre of inner and outer bracts quite different from each other; bracteal leaves small, green, lanceolate; style branches with conical appendage, and tuft of long hairs outside at its base, but short hairs below; stigma surface as 2 wide, raised lateral stripes divided by a groove; antheropodia thickened, distinctly thicker than filament. Basal leaves oblong, narrowed into petiole, entire or with a few weakly developed teeth.

Type of section: *L. pavlovii* (Lipsch.) Cretz.

Note. The species *L. pavlovii* (Lipsch.) Cretz., included in this section, differs rather sharply from other species of the subgenus *Ligularia* by its characters (the structure of the stylodes and stamens, shape of the leaves, presence of nonleafy membranous sheaths at the base of the stem), and in the flora of Soviet Central Asia it is definitely an ancient, narrowly endemic relict. Of all the species of the genus *Ligularia* known to us, *L. virgaurea* (Maxim.) Mattf. can, to some extent, be considered close to *L. pavlovii*.

35. **L. pavlovii** (Lipsch.) Cretz. in Journ. Jap. Bot. XVII (1941) 409.—*Senecio pavlovii* Lipsch. in Fedde, Repert. sp. nov. XXIX (1931) 162.—**!c.**: Lipsch. *ibid.*, tab. CXVIII.

Perennial. Rhizome short, densely covered with slender, filiform adventitious roots and fibrous remnants of dead leaves. Stems one or many, 18–35 cm high, and 2–3 mm thick, with few leaf rosettes, erect, sulcate, covered, as also leaves beneath, with arachnoid white tomentum, denser in upper part, with few nonleafy membranous swollen amplexicaul, sheaths at base, sheaths initially brownish, later almost white, transparent, along margin and at apex white-arachnoid-floccose. Leaves thin; basal leaves in sterile rosettes with oblong-elliptical lamina, 5–10 cm long and 1.6–28.0 mm wide, acute or obtuse, decurrent on petiole, petiole in first[lower] leaves two-thirds as long as lamina, in secondary [upper] leaves half or less as long, midrib prominent, strongly raised beneath, lateral veins very slender, 4–5 pairs; cauline leaves 2–4, elliptical or oblong-elliptical, with short, amplexicaul, sheath-like petiole, sometimes with 2 auricles, upper leaves sessile; all leaves
853 entire or sometimes with few remote teeth. Capitula solitary or often 2–3, borne corymbosely at branch apices; peduncles as also base of capitula arachnoid-tomentose, 1–6 cm long, borne in axils of small, sessile, lanceolate, acuminate leaves. Involucre 1.5–2.0 cm in dia, campanulate-bowl-shaped, with 1–2 small lanceolate or linear bracts at base; involucre bracts 8–12, pale green, on back weakly arachnoid-hairy, distinctly 2 whorled, dimorphic: inner bracts oblong-ovate, short-acuminate, with wide scarious border; outer bracts narrowly lanceolate, often finely long-acuminate, without or with narrow scarious border on one or both sides. Ligulate florets about 8, small, 9–14 mm long, with elliptical, 7 mm long and 2.0–3.5 mm wide ligule, with 5 parallel veins. Tubular florets up to 30, with 7–8 mm-long corolla; limb narrowly campanulate, as long as or slightly longer than tube; apical appendage of anthers short, ovoid, basal appendage short, filament enlarged in upper part into antheropodia; style branches short, erect, with short, conical, apical appendage, with a tuft of somewhat long hairs outside

at its base, but much shorter and thicker hairs below, often up to point of bifurcation. Achenes lighter, stramineous, narrow, 6.5–7.0 mm long; pappus snow-white, as long as achene. Flowering second half of April; fruiting from end of May. (Plate XXXVIII, Fig. 2).

Stony and rubbly slopes.—*Soviet Central Asia*: Tien Shan (Syr-Daryian, Kara-Tau Range). Endemic. Described from Ush-Uzen River in Kara-Tau Range. Holotype in Herbarium of Moscow State University; isotype in Leningrad.

Subgenus 2. Dolichorrhiza Pojark. subg. n. op. cit. 895.—Rhizome slender, woody, creeping. Capitula large, 1–6; involucre indistinctly in 2 whorls, but involucre bracts more or less distinctly dimorphic, broader (inner bracts), with scarious margin and narrower bracts enclosing them, lacking scarious margin and[or] with very narrow scarious border on one or both sides. Antheropodia wide and thick; style branches with very short, roundish, semiconical appendage, flat on inner side, hemispherical in cross section; stigma surface as 2 raised stripes divided by a furrow.

Type of subgenus: *L. renifolia* (C.A.M.) DC.

Three very similar Caucasian species belong to this subgenus.

36. ***L. renifolia*** (C.A.M.) DC. Prodr. VI (1837) 316; Fisch. and Mey. Ind. sem. hort. Petrop. VII, 52; Ldb. Fl. Ross. II, 622.—*Cineraria renifolia* C.A.M. Verz. Pflanz. Caucas. Casp. Meer. (1831) 82.—*Cineraria geifolia* C.A.M. in sched. ex DC. op. cit. 316 (in synon.) non L. (1763).—*L. geifolia* DC. ibid. Fisch. and Mey. loc. cit.—*Senecio renifolius* Sch. Bip. in Flora, XXVIII (1845) 50, non Port. and Coult.; Boiss. Fl. or. III, 401; Grossh. Fl. Kavk. IV, 147; Manden. in Fl. Gruzii, VII, 404.—**lc.**: Manden. ibid., fig. 402.

Perennial. Rhizome oblique, creeping, up to 10 cm long, with few branches at base and often arachnoid-tomentose at nodes, usually 3–5 cm thick, narrowed toward apex, bearing one scale leaf and a tuft of slender adventitious roots at each node, often developing 1, less often 2–3 flowering stems and few leaf rosettes, and then rhizome thicker (up to 1 cm). Stem 12–55 cm high, slender, 1.5–2.0 mm thick in lower part, glabrous, only at base arachnoid-tomentose, usually with 1 basal leaf and 2 cauline leaves. Leaves reniform, often strongly expanded, apically roundish, sometimes with a notch or groove, thin-papery when dry, glabrous excluding margins, sparsely covered with thick, multicellular hairs, sinuate-toothed with rather large, deltoid, abruptly narrowed, callous, acute teeth separated by broad notches; basal leaf 1.5–7.0 cm long and 2.5–12.0 mm wide, petiole thin, 2–4 times as long as lamina; lower cauline leaf arising from lower part of stem,

often larger than basal leaf and with as long petiole; upper cauline leaf usually much smaller and short-petiolate; all petioles expanded into short and narrow sheath, on inner side arachnoid-tomentose. Inflorescence of 1 capitulum, rarely 2–4(5) capitula with remote, peduncles 3.5–13.0 cm long, with thickish hairs at apex, in axils of narrow, small, 0.8–3.5 cm-long, lanceolate or (lower) rhombic leaves and with remote, subulate, small leaves, of which 2–3 upper leaves often near base of involucre; capitula 3.5–5.5 cm in dia; involucre bowl-shaped, 10–13 mm long; involucral bracts (7)9–14, often of different shapes: lanceolate or lanceolate-linear, with distinct membranous border, short- or long-acuminate, and much narrower, linear, long-acuminate, lacking membranous border or with very narrow border on one, less often on both margins; all bracts floccose-pubescent at apices but elsewhere glabrous. Ligulate florets 8–13, with bright yellow, 15–20 mm long, linear-elliptical to oblong-elliptical ligule, with 4–6 veins, tube 4–5 mm long. Disk florets numerous, with 6–7 mm-long corolla; limb almost tubular, gradually narrowed into short, about 2 mm-long tube; anthers with very short basal appendage; filament with weakly enlarged antheropodia; style branches long, twisted, with thick semiconical appendage, with a dense tuft of long (as long as appendage) flat hairs at base of this appendage on inside of branch, style branches in ligulate florets shorter and often lacking tuft of hairs. Achenes 5 mm long, lighter, brownish-yellow, with few ribs; pappus white as long as achene or slightly longer. Flowering second half of June to first half of August; fruiting second half of August to September.

- 855 Alpine and subalpine zones in meadows and upper part of forest zone, in pine and birch forests and shrub thickets in rather wet and shady places, mostly in crevices of rocks and stones.—*Caucasus*: Ciscaucasia, Western Transcaucasia, Dagestan, Glavnyi [Main] Caucasus Range. Endemic. Described from western part of Glavnyi [Main] Caucasus Range. Lectotype in Leningrad.

37. ***L. caucasica*** (MB.) G. Don, in Sweet, Hort. brit. ed. 3 (1839) 382.—*Cineraria caucasica* MB. Fl. taur.-cauc. II (1808) 313, III, I, 573.—*Senecio caucasicus* DC. Prodr. VI (1837) 348; Ldb. Fl. Ross. II, 622; Boiss. Fl. or. III, 401; Grossh. Fl. Kavk. IV, 147; Manden. in Fl. Gruzii, VII, 404.—*Arnica auriculata* Willd. in sched. ex Ldb. loc. cit. (pro synon.).—*Arnica scorpioides* Adams. in sched. ex Ldb. loc. cit. pro synon.—**Ic.**: Manden. loc. cit. fig. 403.

Perennial. Rhizome as in previous species, but always lacking arachnoid hairs and often thicker and then with thicker adventitious roots. Stem erect, strong, sulcate, 23–85 cm high, 2–5 mm thick in lower part, leafy, from middle or above irregularly and sparsely white-

arachnoid-hairy and usually densely pubescent below capitulum. Leaves relatively thicker than in previous species, glabrous or covered with thickish hairs along veins beneath and margin, sinuate-toothed; teeth usually small, deltoid, with callous acute tip; basal leaf usually 1 (less often 2), with strongly broadened, lamina 2.0–3.5 cm long and 5–9 cm wide, reniform, with deeply notched base, roundish apex and large roundish lobes at base, petiole long, thin (3)4–8 times as long as lamina; cauline leaves (2)3–6, lower of them usually larger than basal leaf, also reniform but less expanded and with shorter petiole; upper leaves reduced upward, mostly hastate and short-petiolate, uppermost leaves almost sessile, sometimes lanceolate; petioles of lower leaves usually glabrous and sparsely pubescent, with narrow sheath, upper petioles usually more densely pubescent, with mixture of arachnoid hairs, and usually with 2 auricles, often large (up to 3 cm long), less often petioles of all cauline leaves auriculate (var. *auriculata* Somm. and Lev. in *Tr. SPb. Bot. Sada*, XVI (1900) 241). Common inflorescence of 1, less often 2–6 capitula, corymbose; peduncles 3.5–11.0(13.0) cm long, with a small lanceolate leaf at base and 1–3(4) remote, very small, often subulate leaves above it. Capitula including ligulate florets (3.5)4–7 cm in dia. Involucre bowl-shaped (18–22 involucre bracts) with 3–5 narrow subulate bracts at base, often only slightly shorter than involucre bracts; latter not sharply differing from each other in shape, narrowly lanceolate or lanceolate, long-acuminate, with membranous margin on one or both sides, along margin ciliate, apically floccose, glabrous outside or sparsely arachnoid-hairy. Ligulate florets 15–17, with linear or narrowly elliptical, saffron-yellow ligule 1.5–3.0 cm long, with 7–10 veins; tube about 5 mm long. Disk florets numerous, with 9–11 mm-long corolla; limb campanulate-tubular and as long as tube; anthers, shape of appendages of style branches, and hairs on the latter same as in *L. renifolia*; achenes 4–6 mm long, light colored, brownish-yellow, ribbed-sulcate; pappus white, as long as achene or scarcely longer. Flowering July to August; fruiting from second half of August.

Alpine and subalpine meadows also subalpine birch groves, particularly in crevices and shade of rocks and along streams. —*Caucasus*: Ciscaucasia, Glavnyi [Main] Caucasus Range, Eastern Transcaucasia, Western Transcaucasia (north and Kuba region), Southern Transcaucasia (near Lake Sevan). Endemic. Described from Georgia. Type in Leningrad.

38. ***L. correvoniana*** (Alb.) Pojark. comb. nova.—*Senecio correvonianus* Alb. in Bull. Herb. Boiss. III (1895) 91 and in Tr. Tifl. Bot. Sada, I (1895) 140; Grossh. Fl. Kavk. IV, 147; Manden. in Fl. Gruzii, VII, 403.—*lc.*: Manden. *ibid.* fig. 401.

Perennial. Rhizome oblique, branched, with slender adventitious roots, basally covered with large brown scales, developing many flowering and vegetative shoots, glabrous like base of stems. Stems slender, 20–45 cm high, finely sulcate, with 3–5 remote, small, almost scaly, subulate or linear leaves and rosette of basal leaves, of which 1–2 leaves sometimes in lower part of stem. Leaves thick, finely coriaceous, glabrous, glaucous above, reniform, expanded, some roundish, with broad or often narrow and deep notch and then lateral lobes overlapping with their inner margins, sinuate-toothed, with usually weakly developed teeth, often as one callous cusp, separated by shallow notches, petiole 2.5–4 times as long as lamina, at base weakly expanded into inconspicuous sheath, glabrous or in beginning with sparse floccose-arachnoid tomentum. Capitula solitary, 3.5–5.0 cm in dia; stem below capitulum grayish-tomentose for some distance. Involucre 10–12 mm long, goblet-shaped; involucre bracts 10–16, distinctly dimorphic; broader, oblong-elliptical or elliptical-lanceolate with wide membranous margin and not entirely regular, subsequent bracts narrower, narrowly lanceolate or linear-lanceolate, with or without membranous border on one or both sides; all bracts glabrous on back, tomentose at apex, with 3–4 longitudinal veins and 1–3 small, linear, apical bracteal leaves at base, sometimes bracts distinctly pushed downward on peduncle. Ligulate florets 10–20, with oblong-elliptical or linear ligule, 11–12 mm long and 2.0–4.5 mm wide, with 4–5 veins; tube 3.5–5.0 mm long; style branches long, usually lacking hairs at base of appendage; sometimes florets with staminodes also found. Tubular florets 6.5–7.0 mm long; limb 4 mm long, tubular-campanulate, with narrowly deltoid teeth and 2.5–3.0 mm-long tube; stamens with very short basal appendages of anthers; style branches with a long tuft of hairs outside at base of appendage. Achenes with white pappus, according to Albov—as long as achene or up to twice as long. Flowering June to July. (Plate XXXVII, Fig. 2).

Calcareous wet rocks and talus from the upper part of forest zone to alpine zone.—*Caucasus*: Western Ciscaucasia, Western Transcaucasia. Endemic. Described from material from Abkhazia (author of treatment not known to me) and from Western Transcaucasia (Cherkessia). Type in Tbilisi or in Geneva.

Tribe 9. CALENDULEAE Cass. in Dict. Sc. Nat. XX (1821) 366, XXX (1824) 322, LX (1830) 573; Baill. Hist. des Plantes, VIII (1882) 194; O. Hoffm. in Pflanzenfam. IV, 5 (1890–1894) 303.—Trib. *Calenduleae* Cass. in Bull. Soc. Philom. (1815) 173 and in Dict. Sc. Nat. VI, Suppl. (1817) 35; Benth. in Benth. and Hook. fil. Gen. Pl. II (1873) 209.—Trib. *Cynareae* Less. subtrib. *Calenduleae* DC. Prodr.

VI (1837)[†] 449, 451, p. p.—Fam. *Calendulaceae* Bessey in Ann. Miss. Gard. 2 (1915) 163.—Capitula heterogamous, with ray of pseudo-ligulate florets; receptacle glabrous, less often weakly setose; anthers mostly sagittate; style branches of bisexual florets flat, truncate; corolla yellow or orange, less often ray florets white; pappus lacking or poorly developed; achenes curved, heteromorphic, leaves as a rule, alternate.

Herbs, shrubs, and semishrubs, growing wild only in Old World, mostly in tropics and subtropics; most members of *Calenduleae* are concentrated in South Africa.

GENUS 1565. *Calendula* L.^{1,2}

L. Sp. pl. (1753) 921.

Capitula many-flowered, terminal; involucre of 1–2 whorls of elongate involucral bracts. Outer (ligulate florets pistillate, with linear stigma; inner florets tubular, bisexual, but sterile, with capitate stigma. Achenes in 2–3 whorls, curved (to annular), heteromorphic: outer
858 achenes differing from middle and inner achenes by the form and relief of their surface. Annual or perennial herbs, floccose-glandular, with yellow or orange flowers; 20–30 species in the Mediterranean Region, Western Europe and Middle East.

Some species (*C. officinalis*—"pot-marigold") are among the most popular ornamental plants.

1. Capitula large (up to 4–5 cm in dia); cultivated plant **C. officinalis* L.
- + Capitula smaller; wild plants or weeds 2.
2. Outer achenes falcate, weakly curved 3.
- + Outer achenes strongly curved, more or less annular 4.
3. Outer achenes not winged, more or less terete 3. *C. arvensis* L.
- + Outer achenes winged with setose-toothed, lateral wings, lanceolate 4. *C. karakalensis* Vess.
4. Outer achenes spinose-setose, usually winged (rarely lacking wings), 3 times as large as inner; capitula with fruits lax 1. *C. persica* C.A.M.
- + All achenes usually lacking wings; outer achenes tuberculate or short-subulate, but not setose-spinose, not more than 1.5–2 times as

[†]1937 in the original—General Editor.

¹Treatment by I.T. Vassilchenko.

²From the Latin word *calendae*—first day of the month; indicative of prolonged flowering.

long as inner, sometimes almost equal. Capitula with fruits more dense 2. **C. gracilis** DC.

1. **C. persica** C.A.M. Verzeichn. Pfl. Cauc. (1831) 72; DC. Prodr. VI, 453; Ldb. Fl. Ross. II, 2, 650; Boiss. Fl. or. III, 418; O.A. and B.A. Fedtsch. Perech. Rast. Turk. IV, 221; Grossh. Fl. Kavk. IV, 155.—*C. arvensis* MB. Fl. taur.-cauc. III (1819) 596.—*C. officinalis* auct. non L.: Hohen. in Bull. Soc. Nat. Mosc. VI (1833) 256.

Annual. Plants finely and glandular-floccose; stems few, (5)8–20(30) cm long, ascending or procumbent, arising from branched root collar. Basal leaves petiolate, oblong or oblong-obovate; cauline leaves lanceolate or oblong-lanceolate, acute, usually sparsely toothed, with small teeth or almost entire, sessile. Capitula 8–10 mm in dia, solitary, at fruiting usually globose, at apices of stems.

Involucre in 1–2 whorls; involucre bracts uniformly long, oblong-lanceolate, woolly-glandular, acuminate and often colored (dark purple). Receptacle glabrous, weakly convex; ligules narrow, filiform-linear, golden-yellow, 1.5–2 times as long as involucre. All achenes annular-curved, densely pubescent; outer achenes brownish or brownish-stramineous, considerably (thrice) as long as inner, 7–8 mm wide, entirely spinulose on back, winged on inner side and along edges (lateral wings often pectinate, with lanceolate unequal teeth or involute, and then achenes carinate); inner achenes grayish, lacking wings, finely punctate-tuberculate, on back often with obtuse small tubercles. Flowering April to May.

Dry stony slopes in foothills, rubbly, sandy-stony and sandy plains (foothills), sometimes as weed in fields.—*Caucasus*: Eastern and Southern Transcaucasia; *Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Iran-Afghanistan, Armenia and Kurdistan, Iraq. Described from the vicinity of Baku. Type in Leningrad.

2. **C. gracilis** DC. Prodr. VI (1837) 453; Ldb. Fl. Ross. II, 2, 650; Grossh. Fl. Kavk. IV, 155.—*C. persica* C.A.M. var. *gracilis* Boiss. Fl. or. III, 418.

Annual. Plant floccose-glandular. Stem usually branched from base, ascending, 5–15(30) cm long. Basal leaves oblong, with remote teeth, sometimes indistinctly sinuate, acute, petiolate; cauline leaves shorter, oblong-lanceolate, sessile. Capitula terminal, small, about (3)4–5 mm in dia (at anthesis). Involucre in 1–2 whorls; involucre bracts oblong-lanceolate, acuminate; ligules yellow, 1.5–2 times as long as involucre, filiform-narrowly linear. All achenes curved, annular or almost annular, lacking wings and beak; outer achenes only slightly larger than inner ones (not more than 1.5–2 times as long), on back rugose-tuberculate

or spinulose, not setose-spinose; middle achenes broadly carinate, more or less smooth, inner rugose tuberculate; all achenes more or less homochromous, dark gray, crowded in capitulum forming more or less dense "heads." Flowering April to May.

Weed of fields, roadsides, sometimes on dry (clayey and stony) slopes.—*Caucasus*: Eastern and Southern Transcaucasia; *Soviet Central Asia*: Western Turkmenia (Krasnovodsk, Kara-Kala). *General distribution*: Iran, Balkans-Asia Minor, Mediterranean Region. Described from Karabakh. Type in Paris.

Note. This species (seemingly in secondary habitats) produces a number of forms transitional to *C. persica* (hybrids?). In natural habitats, *C. persica* is confined to sands and light (sandy, rubbly) soils but *C. gracilis* to more compact, clayey-stony soils. This information needs to be verified with more material.

Under better moisture conditions, the following features are observed in plants of *C. gracilis*: sparser pubescence, thickened stems, wider and longer ligules. Such plants are known, for example, from the Firyuza Valley as also from the Alty-Togdan stream near Kara-Kala. I refer them to a separate variety (*C. gracilis* var. *firjusensis* Vass.), which, after collection of more complete material, may possibly be considered as a species.

3. ***C. arvensis*** L. Sp. pl. (1763) 1303; DC. Prodr. VI, 452; Ldb. Fl. Ross. II, 2, 650; Boiss. Fl. or. III, 418; Grossh. Fl. Kavk. IV, 155; 860 Klovov in Vozn. Ros. URSR, 558.—*C. brachyglossa* Rupr. in Bull. Acad. Sc. Pétersb. XIV (1856) 230.—*C. echinata* DC. Prodr. VI (1837) 453.—*C. byzantina* DC. ibid.—*Ic.*: Sibthorp. Fl. Graeca, X (1840) tabl. 920.

Annual. Plant floccose-glandular. Stem simple or branched, 10–30 cm high. Basal leaves oblong-obovate or oblong-spatulate, indistinctly undulate-sinuate, weakly toothed; cauline leaves sessile, oblong, more or less amplexicaul. Capitula 7–9 mm in dia, solitary, terminal. Involucre in 1–2 whorls of acuminate bracts; ligulate florets twice as long as involucre, sulfur-yellow. Outer achenes weakly curved, apically attenuate (with truncate beak), long-spinose on back; middle achenes carinate, bulged; inner achenes small, annular, curved, rugose. Flowering May to June.

Fields, roadsides.—*European part*: Middle Dnieper, Bessarabia, Black Sea Region, Crimea; *Caucasus*: Very rarely as an introduced plant. *General distribution*: Balkans-Asia Minor, Mediterranean Region, Central Europe. Type in London.

4. **C. karakalensis** Vess. sp. nova in Addenda, XXV, 895.

Annual. Plants finely and profusely glandular-pubescent. Stem branched from base. All leaves entire; lower leaves oblong, acute, petiolate; upper ones oblong, also acute, sessile. Capitula small; involucre in single whorl of oblong, acuminate, involucre bracts; ligules yellow, only slightly (not more than 1.5 times) longer than involucre. Outer achenes falcate, large (15–20 mm long), broadly lanceolate, with longitudinal groups of spines and bristles on back in furrow formed by 2 lateral setose-toothed wings, winged on inner side and more or less irregularly toothed; middle achenes carinate (with membranous wings involute), with teeth and spines on back, broadly ovoid or ovoid-roundish, a half as large as outer ones; inner achenes annular, lacking wings, spinose-toothed on back, usually with membranous unilateral process at apex. Flowering April to May.

Clayey slopes.—*Soviet Central Asia*: Mountainous Turkmenia (western Kopetdag). Endemic. Described from vicinity of Kara-Kala. Type in Leningrad.

***C. officinalis** L. Sp. pl. (1753) 921; DC. Prodr. VI, 452; Ldb. Fl. Ross. II, 2, 650; Boiss. Fl. or. III, 416 (in nota); Grossh. Fl. Kavk. IV, 155; Klovov in Vozn. Rosl. URSR, 558; Pidotti, Opred. Semyan. Dakorat. Rast. 81.—**lc.**: Pidotti, ibid. Plate XXIV, 3, 4, 5 (pl.*).

Annual. Plant 20–50(75) cm high; stem often branched from base, green, more or less floccose-glandular. Basal leaves oblong-obovate, with remote teeth or entire, large, petiolate; cauline leaves oblong-lanceolate or oblong-obovate, sessile, more or less amplexicaul, 861 indistinctly undulate and with small, occasional teeth. Capitula large (up to 4–5 cm in dia); involucre in 1–2 whorls of oblong-lanceolate, acuminate, involucre bracts. Florets yellow or orange, sometimes dull, twice as long as involucre; ligules broad, up to 4.5 mm wide. All achenes curved, yellowish or brownish to gray, trimorphic: outer achenes semiannular, large (up to 15 mm long), on outside usually with longitudinal rows of spines, with long, hollow, inwardly bent beak, seemingly truncate at apex; middle achenes carinate, smaller and broader (up to 10–12 mm long, 8–10 mm wide), with a longitudinal rib and spines on back (sometimes without), with wing-like involute lateral processes and a similar middle process; inner achenes grayish, small, annular, spinose or tuberculate. Transients between these forms of achenes observed. Flowering June to September.

It is cultivated everywhere as one of the most popular ornamental plants; sometimes it is found growing as a weed in gardens, kitchen gardens, etc. Described from Europe. Type in London.

Economic Importance. For some time, it has been cultivated for a dye that is used in the food industry. It is also used as a medicinal plant.

GENUS 1565a. **Dipterocoma** Fisch. and Mey.¹*

Fisch. and Mey. Ind. Sem. Hort. Petrop. 1 (1835) 26.

Capitula few-flowered, heterogamous. All flowers tubular; outer flowers pistillate, weakly bilabiate; inner flowers staminate with 5 teeth. Achenes terete, curved spinose on back, with 2 curved cornicles at apex, sometimes some achenes without such cornicles and with short, radial spines. Annuals with narrow alternate leaves.

One species, found in countries of the Middle East.

1. **D. pusilla** Fisch. and Mey. Ind. Sem. Hort. Petrop. I (1835) 26; Boiss. Fl. or. III, 420; Jaub. and Spach, III, pl. or III (1847–1850) 34; Grossh. Fl. Kavk. IV, 156; Nikitin in Fl. Turkm. 7, 140.—*Jaubertia koelpinioides* Spach in Jaub. and Spach, op. cit. 131.—*Koelpinia sessilis* Boiss. Diagn. ser. I, II (1845) 34.—**lc.**: Jaub. and Spach, loc. cit. tab. 289.

Annual. Leaves sessile, somewhat thick, with single vein, obtuse, initially weakly arachnoid-hairy like stem but later glabrous. Capitula with 10–15 florets, 2–3 mm wide; involucre imbricate; achenes stellately arranged, not shedding; 2 cornicles at apex, outer cornicle as long as achene. Flowering March to April.

Clayey deserts, loess foothills.—*Caucasus*: Eastern and Southern Transcaucasia; *Soviet Central Asia*: mountainous Turkmenia, Kara-Kum, Kyzyl-Kum; Amu-Darya, Pamiro-Alai Region. *General distribution*: Eastern Mediterranean Region, Asia Minor, Iran. Described from Transcaucasia. Type in Leningrad.

Tribe 10. ARCTOTIDEAE Cass. in Dict. Sc. Nat. II, Suppl. (1816) 118; XX (1821) 364, XXIX (1823) 447, LX (1830) 573; Benth. in Benth. and Hook. fil. Gen. Pl. II, 110; O. Hoffm. in Pflanzenfam. IV, 5, 307.—*Astérées* on *Corymbiferes* sect. 8. *Arctotides* Cass. in Bull. Soc. Philom. (1812) 191.—Trib. *Cynareae* Less. subtrib. VI. *Arctotideae* Less. Synops. Comp. (1832) 15; DC. Prodr. VI, 449, 484.—Fam. *Arctotidaceae* Bessey in Ann. Miss. Gard. 2 (1915) 163.—*Capitula*

¹From the Greek words *dis*—twice, *pteron*—wing, and *come*—hair; so named because of the corniculate protuberances of the achenes.

*Brought here from the errata on p. 756 of vol. XXVII.

heterogamous or homogamous. Receptacle glabrous, squamose, setose or alveolate. Anthers at base undivided or sagittate, but lacking caudate appendage. Style branches of bisexual florets very short, style of sterile florets not lobed. Leaves mostly alternate, often basal only.

One of the small tribes of the family Compositae. whose species are found only in Old World and, that too, almost exclusively in South Africa.

Subtribe Gundelinae ("Gundelieae") Benth. in Benth. and Hook. fil. Gen. Pl. II (1873) 211; O. Hoffm. in Pflanzenfam. IV, 5, 311.—Cinarocephalae Less. div. II. Gundeliaceae DC. in Ann. Mus. Paris. XVI (1810) 153.—Trib. Gundelieae Boiss. Fl. or. III (1875) 421.—Individual capitula aggregated in globose-capitate compound inflorescence; involucre bracts spiny. Herbaceous plants.

GENUS 1566. *Gundelia* L.^{1, 2}

L. Sp. pl. (1753) 814.

Capitula with 5–7 florets, of which one (central) flower fertile and others (peripheral) sterile. All capitula clustered in globose-capitate glomerules resembling one large head; involucre bracts in certain capitula fused into testaceous membrane, with 5–7 spinules at apex; corolla infundibuliform, exerted from openings of testaceous membrane formed by fused involucre bracts. Achenes large, short-obpyramidal, with small cupule instead of pappus. Perennial herbs with spiny leaves. One species.

1. *G. tournefortii* L. Sp. pl. (1753) 814; DC. Prodr. V, 88; Ldb. Fl. Ross. II, 2, 464; Boiss. Fl. or. III, 421; Post, Fl. Syr. 2, 74; Grossh. Fl. Kavk. IV, 156; Nevski in Sorn. Rast. SSSR, IV, 265.—*G. glabra* Mill. Dict. ed. 8 (1768) 2.—*G. purpurascens* Bornm. in Beih. Bot. Centralbl. IX (1939) 197.—**Exs.:** Bornm. (1892–1893) 1407.

Perennial. Plant large, glabrous or more or less arachnoid-hairy; root thick, containing latex; stem 30–60 cm high, rough and thick, simple or weakly branched above. Leaves coriaceous, stiff, large, oblong or oblong-lanceolate, pinnately divided or lobate, with more or less spiny-toothed lobes apically attenuate into spine, midrib thick and wide. Capitula clustered; general inflorescence (glomerule of capitula), globose-ovoid, surrounded by spiny bracteal leaves, 2–5 cm wide; bracts

¹Treatment by I.T. Vassilchenko.

²Named after A. Gundelscheimer (1668–1718), one of the associates of Tournefort.

in individual capitula terminating into long coarse spine, exceeding capitula. Corolla purple; fruit (achenes) enclosed in a hull (sheath) formed by fused involucral bracts; nut-like "pseudo-fruit" gray or grayish-brown, about 1.2–1.5(1.7) cm long and 0.8–1.2 cm wide, apically with prickly spines. Flowering May to June; fruiting July.

Dry stony slopes in foothills and as weed in non-irrigated crop field.—*Caucasus*: Eastern and Southern Transcaucasia; Soviet Central Asia: mountains Turkmenia. *General distribution*: Eastern Mediterranean Region, Asia Minor, Iran. Described from Syria. Type in London.

Note. Plants with arachnoid-tomentose bracts and a finely scabrous sheath belong to a special variety (var. *asperrima* Trautv.). Boissier (loc. cit.) distinguished one more variety, var. *tenuisecta* Boiss., with pinnate (to dissected) leaves with narrow lobes (segments).

Economic Importance: Achenes edible and contain oil; the young shoots and leaves are also edible. The latex has irritant properties (causes vomiting).

ADDENDA XXV
 DIAGNOSES PLANTARUM NOVARUM IN TOMO XXVI
 FLORAE URSS COMMEMORATARUM

Diagnoses of the New Species in Volume XXVI

November, 1961

ANTHEMIS L.

1. Sect. **Rumata** Fed. sect. nova.

Achenia transverse angulata obconica vel obpyramidata non compressa. Paleae lanceolatae plus-minus carinatae saepe subulatae. Receptaculum convexum vel hemisphaericum. Involucri phylla nigro-marginata vel omnino pallida saepe sphacelata. Herbae perennes vel plantae suffruticulosae, rhizomate indurato vel radice lignosa; caules simplices basi foliosi capitulum saepe unum sat magnum gerentes; folia inciso-lobata vel pinnata ad basin caulis congesta et rosulam diffusam formantia.

Sectionis typus—*A. Soportana* Alb.

Sectio nostra ob acheniorum formam cum sectione typica Anthemidis generis convenit, sed ab ea omnibus characteribus, praecipuae involucri phyllis sphacelatis, caudicibus hypogaeis surculisque sterilibus e collo radici rhizomatisque emittentibus etc. etc., eximie differt.

Sectionis nomen per conversionem anagrammaticam nominis Marutae constitutum.

2. **A. anahytae** Woron. (descripsit Fed.).

Perennis, subglabra vel pilis sparsis obsita, rhizomate indurato fusco caudicibus brevibus et surculis sterilibus foliorum rosulis terminatis instructo; caules sat humiles, ca 10–15(20) cm alti, adscendentes vel erecti, praecipue ad basin foliosi; folia caulina inferiora et surculorum steriliu ambitu obovata vel spatulata, plus-minusve petiolata, caetera sessilia, pinnata, segmentis oblongo-lanceolatis vel linearibus integris vel in lacinulas partitis apice indivisis vel tridentatis, rachide latiuscula edentula; folia caulina superiora diminuta lobulata vel indivisa; capitula sat magna, ca 4–5 cm in diam.; involucri plus-minus pilosi phyllis externis trianlaribus, internis oblongis vel oblongo-obovatis, omnibus fuscis et ad margines late scariosis membranaceis et atro-fuscis vel nigris, ad apicem rotundatis, ad externa ad internis gradatim sphacelatis; ligulis albis oblongo-ellipticis, apice

obsolete tridentatis basin versus valde angustatis; achenia videtur *A. ibericae* consimilia.

Habitat: in regione alpina montium Caucasi minoris Anatoliae orientalis.

Typus: Azerbaidzhania, in monte Gjamisch jugi Murov-dagh, ca. 3000 m s. m. 15 VII 1909. Leg. A.V. Schelkovnikov. Conservatur in Herb. Inst. Bot. Acad. Sci. URSS in Leningrad (Holotypus et Isotypus).

866 **Affinitas:** Ex affinitate *Anthemidis ibericae* M.B. et praesertim ob formam ligulae florum radiantium insignis.

Obs.: Nomen speciei a cl. G. Woronow in honorem collaboratoris suis nomine armeniaco femineo Anahyt dictis et in nostro tempore incognitis datum.

3. *A. tranzheliana* Fed. sp. nova.

Perennis, tota pilis minutis lanuginosis obsita, radice lignosa indurata, caudice elongato apice ramoso residuis petiolorum emortuorum praedito et caules rosulasque foliorum emittente; caules valde elongati, 30–45 cm alti, simplices, monocephali, ad basin et in parte inferiore mediaque tantum foliosi apicem versus nudi, ad basin arcuati erecti vel (in sicco) vix flexuosi, obsolete longitudinaliter striati, infra capitulum non incrassati; folia caulina inferiora et surculorum steriliu petiolata ambitu late ovata in lacinulas lineares inter se distantes indivisas vel apice bi-tripartitas divaricatim bipinnatisecta utringue pilosa, rachide foliorum edentula angusta; capitula mediocria, ca 3–4 cm in diam., involucris plus-minus pilosi phyllis externis triangularibus pallide fuscis, internis-oblongo lanceolatis stramineis ad dorsum nervo mediano atro fusco donatis apice scarioso-membranaceis et interdum nigro-marginatis; ligulis albis late-ovatis integerrimis videtur reflexis; receptaculi hemisphaerici paleis densis stramineis membranaceis acuminatis; achenia (immatura) fusca laeviuscula videtur calva vel apice minutissime marginata. Fl. V–VI.

Habitat: in fissuris rupium umbrosarum solo vulcanico, in regione media montana Tauriae australis juxta Pontum Euxinum.

Typus: Tauria, distr. Sudak-Theodossia, prope stationem scientificam marinam. Ad rupes umbrosas infra summum montis Karadagh. 9 VI 1926. Leg. V. Tranzschel. Conservatur in Herb. Inst. Bot. Acad. Sci. URSS in Leningrad (Holotypus). Specimina Topo-ac paratypica: ibidem 29 V 1952. Leg. Al. Theodorov, An. Fedorov et M. Kirpicznikov.

Affinitas: Affinis *Anthemide sterili* Stev., sed eximie differt statura robustiore, caulibus valde elongatis, capitulis majoribus, foliis divaricatim laciniatis, lacinulis inter se distantibus (nec approximatis) longioribus, ligulis latioribus.

O b s.: Nomen specificum dedi in memoriam beati botanici clarissimi professoris doctoris V. Tranzschel, qui plantam hoc loco descriptam legit.

Sect. Cota (J. Gay ex Guss.) Rupr.

4. *A. maris-nigri* Fed. sp. nova.

867 Perennis, parce pilosiuscula vel pilosa, viridis vel vix incanescens; caules e radice indurata a basi arcuata erecti stricte-ramosi, ca. 40–60(70) cm alti, rigidi longitudinaliter striatuli, usque ad mediam partem et ultra foliosi superne nudi; folia radicalia nulla vel cito decidua, caulina—ambitu obovata pinnata, in segmenta latiuscula et obtusiuscula oblongo linearia margine acuti-denticulata fissa, dentibus inaequalibus sursum orientibus minutissime mucronulatis; capitula sat parva, ca. 2 cm in diam., ligulis luteis abbreviatus obtusis apice obsolete tridentatis disco subduplo brevioribus; involucri villosolano phylla externa triangularia acutissima, interna oblongolanceolata obtusiuscula, omnia ad costam mediam nigrescentia apice fusco barbellata; receptaculi hemisphaerici paleae fuscae oblongae in mucronem rigidum nigrescentem subito contractae; achenia (immatura) straminea transverse subtetragona apice obsolete denticulata facie laeviuscula. VI–IX.

Habitat: in regione silvatica montium Caucasicarum occidentalium.

T y p u s: Caucasus occidentalis (olim Circassia), in abruptis inter fluvios Schache et Czuchuk. 10 IX 1927. Leg. G. Woronow et W. Steup. Specimina paratypica: Abchasia, in pratulis juxta confluvium Bzybj et Gega. 23 VII 1930. Leg. P. Panjutin; Prope urbem Tuapse. 23 VI 1915. Leg. D. Litwinow. Conservantur in Herb. Inst. Bot. Acad. Sci. URSS in Leningrad.

A f f i n i t a s: Inter plures species generis *Anthemidis* e grege *Tinctoriae* m. ob ligulas abbreviatas eminens; differt ab *Anthemide tinctoria*, *A. monantha* et al., praeter notas indicatas, foliis abbreviatis virescentibus, caulibus longissimis stricte-ramosis, involucris phyllis apice fusco fimbriatis et habitatione silvatica montana.

5. *A. markhotensis* Fed. sp. nova.

Perennis, tota ob pilos densos sericeo lanata; caulis in media parte ramosus foliosusque, ca 40–50(60) cm altus, basi et sub capitalum efoliatus, striatellus, rubescens; folia sat densa majuscula ca 3–4 cm longa, ambitu obovata pinnata, segmentis latiusculis oblongo obovatis laciniatis, lacinulis inciso mucronulato denticulatis; capitula majuscula, ca 2–2.5 cm in diam.; ligulis luteis abbreviatis apice rotundatis integerrimis vel interdum obsolete denticulatis, oblongo ovatis disco

manifeste brevioribus; involucri lanati phylla externa triangularia acuti-acuminata, interna oblonga obtusiuscula, omnia pallida; receptaculi hemisphaerici paleae fuscae, externae in mucronem sensuum angustatae, internae—e basi retusa et bilobulata subito contractae; achenia straminea laevia costulata apice inaequaliter et obsolete denticulata. VI–IX.

Habitat: in abruptis sterilibus vel herbosis solo calcareo, in jugo Markhot et ad littora Maris Nigri.

Typus: Caucasus occidentalis, in distr. Gelendzhik, in jugo Markhot. n° 58, 1936 IX. Leg. E. Crniakowska, Specimina paratypica: Distr. Gelendzhik, ad promontorium Tolstyi-myss, in abruptis calcareis littoralibus. n° 25, 1936 IX. Leg. E. Czerniakowska; ad summum jugi Markhot supra sinum Maris Nigri, in declivibus herbosis. 6 VI 1911. Leg. I. Palibin et N. Vorobjev.

Affinitas: Inter omnes species seriei *Tinctoriae* m. ob pubescentiam densam sericeo-lanatam foliorum formam et magnitudinem eorum insignis.

6. *A. debilis* Fed. sp. nova.

Perennis, ob pilos breves sat densos canescens; caulibus e radice indurata fusca adscendentibus partim subprostratis debilibus parum ramosis vel simplicibus sat tenuibus, ca 15–20(40) cm altis, usque ad partem mediam foliosis superne nudis; folia tantum caulina valde approximata abbreviata parva, ca 7–10(15) mm longa, ambitu late ovata pinnata, segmentis linearibus acutis et acute dentato-lanciniatis approximatis, lacinulis acutis mucronulatisque; capitula mediocria vel parva, ca 2.5–3 cm in diam., ligulis aureo-luteis, interdum reflexis oblongo lanceolatis apice obsolete denticulatis; involucri lanati phylla omnia pallida, externa triangularia ad costam mediam virescentia, interna oblongo lanceolata obtusiuscula apice densius tomentella; achenia ignota. V–VI.

Habitat: in declivibus montosis siccis apertis et inter arbores.

Typus: Asia minor, distr. Artvin, in angust. Godrochevi. 11 VI 1909. Leg. P. Nesterov. Specimina paratypica: In ejusden districtu, Sanonet—tapa, 25 VI 1909; prope pag. Toigom, 13 VI 1909; prope pag. Kvartzchany, 21 VI 1909; prope custodiam Gurzhany, 30 V 1910 (Omnia specim. a cl. P. Nesterov lecta).

Affinitas: E grege *Anthemidis tinctoriae* s. l., differt foliis valde abbreviatis parvis et approximatis, capitulis minoribus, ligulis abbreviatis, caulibus debilibus parum subprostratis. Probabiliter cum *Anthemide brachyglossa* C. Koch convenit, sed ob defectum speciminum authenticum Kochianum mea manu in statu speciei novae hoc loco descripta est. Plusminus accedit ad *Anthemidem cretaceam* Zefir. sed ab ea ob caules simplices distinguenda.

7. **A. linczevskyi** Fed. sp. nova.

Perennis, virescens, radice dura, tota pilis adpressiusculis parce tecta; caules elongati stricti, ad basin subarcuati dein erecti, longitudinaliter striati, monocephali, ca 60 cm alti, simplices, a basi usque ad dimidiam longitudinis foliosi, superne aphylli, maturitate rigidi virguliformes; folia radicalia cito decidua; caulina—ambitu oblonga sursum declinantia, pinnata, in segmenta anguste-linearia laciniato-denticulata divisa, dentibus laciniisque sursum orientibus inaequalibus acutissimis; rhachide foliorum angusta plus minus laciniata, capitula mediocria, ca 3 cm in diam.; ligulis albis disco vix brevioribus oblongo ellipticis utrinque angustatis apice retusis vel obsolete bi-tridentatis; involucri villosuli phylla omnia pallida, externa—triangularia lanceolata, interna—oblongo lanceolata obtusiuscula apice fusca vix fimbriata; receptaculi hemisphaerici paleae straminae membranaceae acutissimae acuminatae, achenia violacea apice latiuscule marginata. V–VI.

Habitat: in declivibus sat aridis et in dumetis, in montibus Kopetdagheis Turcomaniae.

Typus: Montes Kopet-dagh occidentales, distr. Kara Kala, in declivibus australibus montis Chasardagh, in angust. Joldere, alt. 1350 m s. m. 23 VI 1931, n° 322. Leg. I. A. Linczevsky. Specimina paratypica: In ejusdem districtu. ad declivitatem montis Sjunt prope summum, alt. 1550–1650 m s. m. 11 VI 1931. n° 362 ej. lectum.; in ejusdem distr., sine indicatione exacta; in monte Sjunt, ad decliv. borealem, inter frutices, alt. 1100 m s. m. 12 VI 1930. Leg. E. G. Bobrov; in declivibus occidentalibus montis Chasardagh, in umbra arborum alt. 1350 m. 19 VI 1930, n° 355. Leg. E. G. Bobrov; Kopet-dagh, in angust. Joldere 21 V 1917. n° 149. Leg. E. Korovin; Turcomania, distr. Kara-kala. In montibus Kassa-dagh orient., in agris derelictis. 24 VII 1935. Basil. Nikitin.

Affinitas: Plus minusve affinis *Anthemide dumetori* Sosn.,
869 sed ob folia magis elongata virescentia (nec canescentia), segmenta angustiora valde elongata, inter se distantia; involucri phylla interna apice fusco-fimbriata et ob habitum alienum primo aspectu insignis.

Obs.: Nomen specificum dedi in honorem amiciss I. A. Linczevsky, investigatoris cl. florae Asiae Mediae, Sinae austro-occidentalis et tropicae etc., etc., qui plantam hoc loco descriptam in variis locis Turcomaniae legit.

8. **A. talyschensis** Fed. sp. nova.

Perennis, radice dura pluricepiti fusca ad collum residuis petiolorum emaricidorum instructa; tota planta ob pilos densos vel densissimos villosos tomentum formantes incana; caules e basi incurvata adscendentes vel erecti plus minus ramosi, ramis capituliferis monocephalis vel partim sterilibus,

usque ad dimidium longitudinis foliosi dein nudi, ca 20–30 cm alti, internodiis valde albo lanuginosis abbreviatis; folia brevia ambitu late ovata omnia sessilia in segmenta oblongolineariter denticulata approximata fissa; capitula medioria, ca 3–4 cm in diam.; ligulis albis oblongis utrinque angustatis apice obsolete tridenticulatis discum aequantibus vel eo vix longioribus; involucri villosi phylla externa triangularia, interna oblongo lanceolata, omnia pallida, apice margineque scarioso membranacea; receptaculi hemisphaerici paleae fuscae membranaceae oblongae in mucronem acutum brunneum abrupte angustatae; achenia obconica prominenter costulata fusca apice coronulis obsolete denticulatis terminata; fl. V–VII; fr. VIII.

Habitat: in declivibus lapidosis montium Talyschensium in regione media ac arida.

Typus: Prov. Baku, distr. Lenkoran, inter pagos Tuli et Dzhoni. 12 V 1912. Leg. A. A. Grossheim. Specimina paratypica: montes Talyschenses, prope pag. Czairu, alt. 4800 m s. m. 4 VIII 1897. Leg. Th. Alexeenko; Talysch, in steppis inter pagos Amuram et Dugja, alt. 4000 m s. m. 12 VI 1894. Leg. A. Lomakin; Transcaucasia, Azerbaidzhan, prov. Baku, distr. Lenkoran, inter pagos Lerik et Tellavaj. 11 VII 1930. Leg. L. Prilipko; Ad trajectum inter pagos Lerik et Busaczar, in declivitate australi ac austro-orientali lapidosa, alt. ca 1700 m s. m. 3 VII 1931, n° 587. Leg. N. Schipczinsky; Distr. Lenkoran, inter montes Naduz-galassi et Tevile-band. 13 VII 1929. Leg. L. Prilipko.

Affinitas: Ex affinitate *Anthemidis dumetori* Sosn. et ab ea optime differt foliis valde abbreviatis densius lanuginoso-villosis, internodiis caulibusque abbreviatis, involucri phyllis villosis et ramificatione aliena. Ob pubescentiae densitatem, foliorum formam, habitum quasi alpinum, involucrum characterem et aream geographicam separatam inter omnes species seriei *Rigescentis* m. insignis et incomparabilis.

9. *A. abagensis* Fed. sp. nova.

Perennis, glabriuscula vel pilis scabridis albidis parciore obsita, sed saturate-viridis, radice fusca lignosa; caulis erectum monocephalus usque ad mediam partem foliosus superne nudus striatellus, ca 40–50 cm altus, basi arcuatim in curvatus; folia radicalia cito decidua, caetera caulina sessilia ambitu lato obovata pinnata, in segmenta latiuscula circumscriptione late ellipsoidea pectinatim incis et obtusi-dentata divisa, dentibus apice callosis et minutissime subulatis; capitula medioria ca 4–4.5 cm in diam.; involucri subglabri vel pilosiusculi phyllis externis obongo-trigoniformibus marginibus anguste atro fuscis, internis-oblongis ad dorsum flavido-viridibus, ad margines apicemque

late-atrofusciis vel nigrescentibus scarioso membranaceis fimbriatisque; receptaculi haemisphaerici paleis membranaceis pallidis acuminatis; ligulis albis in sicco vix lutescentibus oblongis disco vix brevioribus integerrimis; achenia ad huc ignota. VII.

Habitat: in pratis subalpinis montium Caucasicorum tantum occidentalium.

Typus: Caucasus occidentalis, Reservatum Caucasicum, in monte Abago. 24 VII 1956. Leg. Erschov. Conservatur in Herb. Inst. Bot. Acad. Sc. URSS (Holotypus). Isotypus—in Herb. Reserv. Caucasic.

Affinitas: Indubie ex affinitate *Anthemidis zyghiae* Woron., sed primo intuitu foliis glabriusculis saturate viridibus (nec cinereo-incanis) vel ob pilos sparsos scabridis (nec velutino-lanuginosis) eximie differt.

10. *A. schischkiniana* Fed. sp. nova.

Perennis, pilis albidis parce obsita, viridis; radice lignosa; caulos plures vel solitarii, monocephali, a basi et ad mediam partem foliosi, superne nudi, ca 50–60 cm alt., e basi arcuata erecti, striatelli; folia lasalia nulla vel probabiliter cito decidua; caulina-ambitu late ovata, sessilia, in segmenta lacinulasque bi vel tripinnatisecta, lacinulis oblongo linearibus acutis minutissime mucronulatis; capitula medioria, ca 4 cm in diam., involucris subglabri vel parce pilosi phylla externa oblongotrigona, interna—oblongo lanceolata fusco scariosa membranacea; receptaculi hemisphaerici paleae membranaceae acuminatae discum vix superantes; ligulae albae oblongo-lanceolatae sursum deorsumque angustatae apice obsolete bi-tridentatae vel retusae in sicco vix lutescentes; achenia nulla. VII–VIII.

Habitat: in rupibus regionis montanae mediae partim silvosae Transcaucasiae austro-occidentalis.

Typus: Transcaucasia, Georgia, prov. Kutais, distr. Ozurgety (Guria), prope Bachmaro, ca 2000 m, in rupestribus. 17 VII 1925. Leg. A. Grossheim (A. Grossheim et B. Schischkin, *Plantae orient. exs.*, n° 245, Anno 1928), (sub *Anthemide platyglossa*). Specimina paratypica: Jugum Adzharo-Imereticum, in monte Schavnaabad regione alpina. 6 VIII 1914. Leg. E. I. Kikodze; in districtu Achaltziche, prope Abbas-tuman, in silvis coniferis ac mixtis, prope Zekaram. 12 VIII 1914. Leg. E. I. Kikodze. Conservatur in Herb. Inst. Bot. Acad. Sci. URSS in Leningrad.

Affinitas: Ob folia saepius tripinnatisecta et ob lacinulas minutissimas inter omnes species seriei *Rigescentis* m. insignis.

Nomen speciei descriptae dedimus in honorem B.C. Schischkin, redactoris «Florae URSS» illustrissimi ac praeclari.

MATRICARIA L.

11. *M. tzzelevii* Pobed., sp. nov.

Annua. Radix brevis, autumno dura; caulis tenuis, a basi multiramosus, 8–15 cm altus, primo vere pilis setosis strictis brevibus, post anthesin solum sub calathidiis pilosus; folia oblonga, 15–20 mm lg., 3–5 mm lt. imparipinnata foliolis simplicibus crassiusculis teretibus mucronulatis, hispidis vel glabris, suprema-saepe indivisa linearia; pedunculi monocephali, tenues, 2–5.5 cm lg. Calathidia 7–10 mm in diam., receptaculum anguste-conicum, cavum, torulosum; involucrum subuniseriatum, phylla involucris late elliptica, margine albo-membranaceo lacera; flores radii 1.5–3 mm lg., 1.5 mm lt., ligulae breves, latae, albae, apice tridentatae, sub anthesi revoluti, flores disci tubulosi flavi limbo 5-dentato, dentibus subtriangularibus, tubo in medio strangulato; antherae apice appendicibus brevibus lanceolatis, stylus flosculi radii exsertus, stylus flosculi disci occultatus; achenia 1.5 mm lg., 0.5 mm lt., teretiuscula, compressa, apice obliqua, costis quinque tenuibus, pappus nullus. VIII.

Habitat: in declivibus schistosis.

Species: Tauria, dist. Sudak, in declivibus montis «Bolvan», prope pagum Ujutnoe, 11 VIII 1960, leg. N. Tzvelev.

A. Matricaria recutita L. caulibus humilioribus, 8–15 cm alt. (nec 10–30 cm), prostratis, foliis saepe hispidis, calathidiis minoribus 7–10 mm in diam. (nec 10–15 mm) differt.

PYRETHRUM Zinn

12. Sect. *Leptanthemum* Tzvel. sect. nova.—Plantae herbaceae, 15–50 cm alt., pilis accumbentibus bifurcatis et simplicibus plus minusve tectae; caules parce foliati, foliis bipinnatisectis. Calathidia vulgo numerosa, in inflorescentiam laxam corymbiforme-paniculatam congesta; involucri late semiglobosa, 6–11 mm in diam., phyllis internis exteris sesqui, rarius duplo longioribus; receptaculum subplanum; ligulae late ovales, 5–7 mm lg. Achenia 1.5–2 mm lg., nervis (4)5(7) longitudinalibus percursa, pappo circa 0.2 mm lg., irregulariter dentato vel lobato.

Typus sectionis (species unica): *Pyrethrum leptophyllum* Stev.

13. Sect. *Balsamitopsis* Tzvel. sect. nova.—Plantae herbaceae, 30–70 cm alt., pilis bifurcatis adpressis valde compressis dense tectae; caules parce foliati; laminae foliorum radicalium integrae. obovatae vel late ellipticae, caulinarum—lyrato-pinnatifidae. Calathidia 1–6,

saepe inflorescentiam corymbiformi-racemosam formantia; involucri semiglobosa, 8–15 mm in diam., receptaculum parum convexum, subplanum; ligulae oblongo-lineares 9–17 mm lg. Achenia 2.5–2.8 mm lg., nervis 5–8 longitudinalibus percursa, pappo 0.3–0.4 mm lg., irregulariter obtuse dentato.

Typus sectionis (species unica): *Pyrethrum Kelleri* (Kryl. et Plotn.) Krasch.

- 872 14. Sect. **Pyrethrellum** Tzvel. sect. nova.—Plantae herbaceae, 5–80 cm alt., pilis brevibus bifurcatis et simplicibus vel solum simplicibus plus minusve tectae, saepe subglabrae; laminae foliorum plus minusve pinnatisectae. Calathidia vulgo solitaria, rarius 2–10(40) et inflorescentiam laxam irregulariter corymbiformem formantia; involucri semiglobosa, 8–20 mm. in diam.; receptaculum vulgo valde convexum semiglobosum, rarius parum convexum; ligulae oblongae vel lineares, 7–25 mm lg. Achenia 1.8–3.2 mm lg., nervis 5–8 longitudinalibus percursa, pappo 0.1–0.5 mm lg., rarissime (*P. Komarovii* Sosn.) 0.5–1.3 mm lg., irregulariter dentato vel lobato.

Typus sectionis: *Pyrethrum coccineum* (Willd.) Worosch.

15. Sect. **Xylopyrethrum** Tzvel. sect. nova.—Plantae prope basin plus minusve lignescentes, 5–20 cm alt., pilis adpressis vel accumbentibus bifurcatis vel bifurcatis et simplicibus plus minusve tectae; caules parce foliati; laminae foliorum plus minusve pinnati-vel palmati-sectae, lobulis terminalibus angustissimis. Calathidia solitaria, involucri semiglobosa, 5.5–12 mm in diam.; receptaculum valde convexum conico-semiglobosum; ligulae ovals vel oblongae, 7–12 mm lg. Achenia 2–3 mm lg., nervis 5–7 longitudinalibus percursa, pappo 0.2–1 mm lg., irregulariter dentato vel lobato.

Typus sectionis: *Pyrethrum Kotschy* Boiss.

16. Sect. **Richteriosis** Tzvel. sect. nova.—Plantae herbaceae, 15–35 cm alt., pilis accumbentibus bifurcatis (rarius partim simplicibus) dense tectae; caules parce foliati; laminae foliorum bipinnatisectae, lobulis terminalibus vulgo angustissimis. Calathidia solitaria, rarius 2–8, involucri semiglobosa, 9–20 mm in diam.; receptaculum parum convexum, subplanum; ligulae oblongae vel oblongo-lineares, 7–20 mm lg. Achenia 1.8–3.2 mm lg., nervis 8–12 longitudinalibus percursa, pappo 0.1–0.3 mm lg., irregulariter dentato vel lobato.

Typus sectionis: *Pyrethrum sericeum* (Adam) M.B.

17. Sect. **Brachyglossa** Tzvel. sect. nova.—Plantae prope basin plus minusve lignescentes, 10–50 cm alt., pilis sat longis bifurcatis et

simplicibus vel solum simplicibus plus minusve tectae; caules parce foliati; laminae foliorum pinnatisectae. Calathidia solitaria, rarius 2–5; involucri anguste semiglobosa, 6–13 mm in diam., receptaculum parum convexum, subplanum; ligulae ovoides, rarius oblongae, 6–12 mm lg. Achenia 2.3–3.2 mm lg., nervis 6–8 longitudinalibus percurta, pappo 0.2–0.6 mm lg., irregulariter lobato vel dentato.

Typus sectionis: *Pyrethrum hissaricum* Krasch.

18. Sect. **Trichanthemopsis** Tzvel. sect. nova.—Plantae prope basin plus minusve lignescentes, 6–25 cm alt., pilis patulis simplicibus sparse tectae, saepe glabrae; caules parce foliati; laminae foliorum pinnatisectae (vulgo bipinnatisectae), lobulis terminalibus angustissimis. Calathidia solitaria; involucri late semiglobosa, 10–16 mm in diam.; receptaculum valde convexum, semiglobosum; ligulae oblongoovoides, 873 6–15 mm lg. Achenia 2.5–3.5 mm lg., nervis 5–10 longitudinalibus percurta, pappo 1.2–2.5 mm lg., usque ad basin lobis 5–10 dissecto.

Typus sectionis (species unica): *Pyrethrum tianschanicum* Krasch.

19. **P. corymbiforme** Tzvel. sp. nova.—*P. corymbosum* var. «*fol. segmentis profundius divis, pappo coroniforme brevior*» Ldb. Fl. Ross. II, 551.

Planta 30–100 cm alt., pilis sparsis simplicibus tecta, saepe subglabra; caules erecti, sat parce foliati, simplices (inflorescentia exclusa); folia radicalia et caulina inferiora ad 20–25 cm lg. et 6–8 cm lt., longe petiolata, laminis ambitu oblongis vel late linearibus, pinnatisectis, segmentis pinnatifidis vel pinnatilobatis, margine plus minusve dentatis, dentibus longe acutatis. Calathidia (1)2–6(10), in inflorescentiam laxam corymbiforme—racemosam congesta, pedunculis longis, ad 15–18 cm lg.; involucri 8–12 mm in diam. et 3.5–4.5 cm alt., glabra, phyllis margine angustissime fusciscentis membranaceis; ligulae albae, 9–15 mm lg. Achenia 2–2.5 mm lg., nervis 5–8 longitudinalibus percurta, pappo 0.3–0.5 mm lg., irregulariter lobato et dentato.

Habitat: in pratis et fruticetis montium Alatau songoricus.

Typus: In rupestribus Alatau ad fl. Sarchan. Enum. 1841, n° 441, Karelin et Kirillov. In Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

A *P. corymboso* (L.) Willd. pubescentia (pilis solum simplicibus), involucri glabris, inflorescentia corymbiforme-racemosa et pappo brevior (non 0.5–0.8 mm lg. differt).

20. ***P. mikeschinskii*** Tzvel. sp. nova.

Planta 20–30 cm alt., rhizomate incrassato, caudiculos plus minusve lignescentes caulibus floriferis et rosulis foliorum terminatos emittente; caules erecti vel basi ascendentes, parce foliati, solum prope basin ramosi; folia canescente-viridia, pilis accumbentibus bifurcatis (partim simplicibus) copiose tecta, radicalia ad 10 cm lg. et 1.3 cm lt., longe petiolata (sed petiolis laminis brevioribus), basi valde dilatata, laminis ambitu late linearibus, pinnatisectis, segmentis oblongis, plus minusve pinnatisectis vel pinnatilobatis, lobulis terminalibus lineari-lanceolatis ad 1.2 mm lt., apice breviter mucronatis, caulina pauca et minora, sessilia vel subsessilia. Calathidia solitaria, longe pedunculata; involucria 6–8 mm in diam. et 5–7 mm alt., pilosa phyllis coriaceo-herbaceis, exteris lanceolato-ovatis, internis oblongo-lanceolatis margine fusciscentem membranaceis exteris sesqui vel duplo longioribus; receptaculum subplanum; flores evoluti deficientes. Achenia matura ignota; pappus circa 0.2 mm lg., fere ad basin irregulariter lobatus.

Habitat: in declivitatibus lapidosis et stepposis jugi Turkestanici.

Typus: Declivitas borealis jugi Turkestanici, in fontibus fl. Isfara supra pag. Voruch, alt. circa 2900 m s. m., 22 VI 1938, n° 58, G. Mikeschin. In Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

A. P. hissarico Krasch. et *P. Galae* M. Pop. forma et pubescentia foliorum bene differt.

874 21. ***P. songaricum*** Tzvel. sp. nova.—*P. pyrethroides* ssp. *songaricum* Krasch. in herb.

Planta 15–35 cm alt., griseo-viridia, laxiuscule tomentosa; caules erecti parce foliati, simplices vel pauciramosi (ramis 1–3); folia radicalia ad 8–10 cm lg. et 3 cm lt., longe petiolata, laminis ambitu late linearibus vel lineari-oblongis, tripinnatisectis, lobulis terminalibus lineari-lanceolatis et lanceolato-oblongis, ad 1 mm lt., caulina vulgo minora, sessilia, laminis bipinnatisectis. Calathidia solitaria, rarius 2–4, longe pedunculata; involucria 10–18 mm in diam. et 5–8 mm alt., plus minusve tomentosa, phyllis herbosis, margine sat late atrofusce membranaceis; corollae florum ligulorum albae, ligulis 8–14 mm lg. Achenia 2.5–3 mm lg., nervis 6–8 longitudinalibus percursa, pappo 1–1.5 mm lg., vulgo ad medium (et minus) irregulariter dentato vel lobato.

Habitat: in declivibus lapidosis et saxosis supra 2000 m. s.

Typus: Alatau songoricus, systema fl. Koksui prope montem Kuvtas, 11 VIII 1948, V. Goloskokov. In Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

A. P. pyrethroides (Kar. et Kir.) B. Fedtsch. ex Krasch. caulibus altioribus saepe ramosis et pappo acheniis irregulariter dentato vel lobato (non ad basin dissecto) differt.

22. **P. neglectum** Tzvel. sp. nova.

Planta 12–30 cm alt., copiose sed laxiuscule albide tomentosa; caules erecti, parce foliati, simplices vel pauciramosi (ramis 1–2); folia radicalia ad 8–10 cm lg. et 2.5 cm lt., longe petiolata (petiolis saepe laminis subaequalibus), laminis ambitu oblongo-ovatis vel oblongis, tripinnatisectis, lobulis terminalibus lanceolato-linearibus vel lanceolato-ovatis, ad 0.6 mm lt., caulina vulgo minora et minus dissecta, superiora sessilia. Calathidia solitaria, rarius 2–3, longe pedunculata; involucria 7–12 mm in diam. et 4–5 mm alt., copiose tomentosa, phyllis herbosis margine comparate anguste fusco vel atrofusco membranaceis; corollae florum ligulatorum albae vel roseo-albae, ligulis 6–10 mm lg. Achenia 1.8–2.3 mm lg., nervis 6–8 longitudinalibus percursa, pappo 0.6–0.8 mm lg., usque ad basin lobis 5–8 dissecto.

Habitat: in decliviis lapidosis et saxosis montium Tjan-Schan.

Typus: Jugum Czatkalense, montes Kuldambes prope lac. Sary-Czilek. 17 VII 1908, V. Rovinski. In Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

A *P. pyrethroides* (Kar. et Kir.) B. Fedtsch. ex Krasch. pubescentia albide tomentosa et involucri phyllis margine vulgo fusco et angustius membranaceis differt.

23. **P. urgutense** M. Popov in Trud. Uzbeksk. Gos. Univers. Nov. Ser. n° 27, Biol. XIV (1941) 80, Russk. diagn et in litt.

875 Planta perennis, 18–40 cm alt.; caules numerosi, erecti vel ascendentes, parce foliosi, ramosi, basi tomento cingentes; folia pilosa, ad 10 cm lg., laminis ambitu lineari-oblongis, bi-vel tri-pinnatisectis, lobulus terminalibus ad 1 mm lg. Calathidia (1)2–6(8), in inflorescentiam laxam corymbiforme—racemosam congesta, homogama; involucria 7–12 mm in diam.; receptaculum convexum, sparse pilosum vel glabrum; flores omnes tubulosi, corollis flavis, 2.2–2.8 mm lg., superne copiose pilosis. Achenia 2–2.4 mm lg., 5–6-costata, pappo 0.3–0.6 mm lg., irregulariter acute dentato.

Habitat: in declivis saxosis et lapidosis jugi Zeravschanici.

Typus: Jugum Zeravschanicum, infra trajectum Kirk-arcza prope pag. Farab, 18 VII 1934, K. Zakirov. In Herb. Univers. Asiae mediae (Taschkent) conservatur.

A specie proxima *Tanaceto Krascheninnikovii* Nevski praesertim corollis florum superne copiose pilosis differt.

24. *SPATHIPAPPUS* Tzvel gen. nov.

Calathidia vulgo solitaria (sed in planta saepe numerosa) heterogama; involucri late semiglobosa, 10–18 mm in diametro et 4–6 mm alt., phyllis herbaceis, imbricatis, 3–4-serialibus, exteris lanceolatis, internis late linearibus sesqui vel duplo longioribus; receptaculum leviter convexum, glabrum; flores marginales ligulati, uniseriales, sat numerosi, gynoecei, sed semper steriles; corollae albae cum germine epapposo vel subepapposo concrescentes, tubo valde compresso, 1.2–1.6 mm lg., ligulis oblongo-linearibus 7–10 mm lg.; flores disci numerosi hermaphroditi, tubulosi, flavi, tubo corollae angusto et sat longo, superne sensim dilatato; antherarum appendices apicales lanceolato-ovatae, obtusiusculae; rami stylorum lineares, truncati. Achenia florum disci conformia, glabra, subteretia, 3–3.5 mm lg. et circa 0.5–0.6 mm lt., costis longitudinalibus 5–6 leviter prominentibus percurta, pappo integro secundo auriculiformi 1.5–2.4 mm lg. coronata. Plantae perennes; caules numerosi, prope basin lignescentes, calathidiorum pedunculis longis terminati; folia alterna; laminis bipinnatifidis.

Typus generis: *Spathipappus Griffithii* (Clarke) Tzvel.

A genere *Pyrethrum* Zinn pappo secundo auriculiformi et floribus ligulatis sterilibus differt.

WALDHEIMIA Kar. et Kir.

25. *W. transalaica* Tzvel. sp. nova.

Planta perennis, ad 10 cm alt., laxe griseo-tomentosa; caules numerosi, simplices, ascendentes vel erecti, sed prope basin vulgo procumbentes; folia ad 2.5–3 cm lg. et 1(1.5) cm lt., longe petiolata, laminis ambitu subovatis, bipinnatifidis rarius pinnatifidis, segmentis e quovis latere 2–5, lobulis terminalibus lanceolatis vel ovatis, ad 1 mm lt., apice mucronatis. Calathidia solitaria, heterogama; involucri 1.2–2 cm in diam. et 4–6 mm alt.; flores ligulati 6–20, albi, ligulis 7–12 mm lg. et 2–4 mm lt. Achenia 3–4 mm lg., usque ad basin dense pilosa, pappo 5–7 mm lg. (tab. XI, fig. 1).

876 H a b i t a t: in locis glareosis et lapidosis jugi Transalaici supra 3000 m s. m.

T y p u s: Kirghisia, jugum Transalaicum, locus glareosus in fontibus fl. Kapstur, 11 VIII 1933, n° 867, I. Tyszenko. In Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

A specie proxima *W. tomentosa* (Decne.) Rgl. forma foliorum et acheniis usque ad basin dense pilosis differt.

CANCRINIA Kar. et Kir. emend. Tzvel.

26. Sect. **Polychrysum** Tzvel. sect. nov.—Calathidia numerosissima (plus 40), parva, in inflorescentia corymbiformi ad 25 cm in diametro dense congesta; involucri semiglobosa, 3–4 mm in diametro; receptaculum convexum, sed margine subplanum, glabrum. Achenia 1.3–1.8 mm lg. sat dense, sed breviter glandulose pilosa, pappo 0.4–0.7 mm lg. fere ad basin dissecto coronata. Plantae perennes, monocarpicae, 30–150 cm alt.

Typus sectionis (et species unica): *Cancrinia tadshikorum* (Kudr.) Tzvel.

27. Sect. **Tanacetopsis** Tzvel. sect. nova.—Calathidia vulgo numerosa (ad 40), in inflorescentia paniculate-corymbiformi vel corymbiformi laxa, rarius dense congesta; involucri late semiglobosa, 6–14 mm in diametro; receptaculum convexum, glabrum, rarius sparse pilosum. Achenia 1–2.4 mm lg., glabra, pappo 0.1–1.5 mm lg. plus dissecto vel dentato coronata. Plantae perennes, polycarpicae, (8)20–70 cm alt.

Typus sectionis: *Cancrinia mucronata* (Rgl. et Schmalh.) Tzvel.

28. Sect. **Matricarioides** Tzvel. sect. nova.—Calathidia solitaria (sed in planta saepe numerosa); involucri late semiglobosa, 7–12 mm in diametro; receptaculum valde convexum, subconicum, glabrum. Achenia 1.8–2.2 mm lg., glabra, pappo 0.8–1 mm lg., fere ad medium irregulariter et obtuse lobato coronata. Plantae biennes vel perennes (?), monocarpicae, 5–20 cm alt.

Typus sectionis (et species unica): *Cancrinia discoidea* (Ldb.) Poljak.

29. CANCRINIELLA Tzvel. gen. nov.

Calathidia solitaria (sed in planta saepe numerosa), homogama; involucri semiglobosa, 6–10 mm in diametro et 3.5–6 mm alt., phyllis herbaceis, bi-vel uniserialibus, subaequilongis, lanceolatis vel oblongo-lanceolatis; receptaculum valde convexum, parce et breviter pilosum; flores disci tubulosi, flavi, tubo corollae parum et sensim dilatato; antherarum appendices apicales lanceolato-ovatae, obtusae; rami stylorum lineares, truncati. Achenia conformia, glabra, teretia, 2.4–2.8 mm lg. et 0.6–0.7 mm lt., costis longitudinalibus 10 valde prominentibus percurta, pappo 0.4–0.6 mm lg., ad (vel fere ad) basin lobis 6–10 magrine irregulariter et obtuse dentatis dissecto coronata. Plantae

877 perennes, herbaceae (sed prope basin sublignescentes), humiles, copiose et longe pilosae; inervationes sat numerosae valde abbreviatae et dense congestae, rosulis foliorum et calathidiis in pedunculis longis aphyllis vel subaphyllis terminatae.

Typus generis (species unica): *Cancriniella Krascheninnikovii* (Rubtz.) Tzvel.

A genere proximo *Cancrinia* Kar. et Kir. habitu singulari, involucri phyllis subaequilongis et acheniorum costis 10 valde prominentibus bene differt.

TRICHANTHEMIS Rgl. et Schmalh. emend. Tzvel.

30. Sect. **Subbulbosa** Tzvel. sect. nova.—Involucra 12–20 mm in diametro, phyllis internis exteris sesqui vel duplo longioribus; receptaculum valde convexum, dense pilosum; flores ligulati numerosi, flavi; corollae florum omnium extus pilosae. Achenia 2.8–3.6 mm lg., pappo 3–4.2 mm lg. ad basin dissecto coronata. Plantae herbaceae, caulibus basi subbulbose incrassatis.

Typus sectionis (species unica): *Trichanthemis radiata* Krasch. et Vved.

31. Sect. **Pyrethroides** Tzvel. sect. nova.—Involucra 9–12 mm in diametro, phyllis internis exteris duplo vel triplo longioribus; receptaculum convexum, glabrum vel subglabrum; flores ligulati numerosi albi vel deficientes; corollae florum semper glabrae. Achenia 2–3 mm lg., pappo 1.5–2 mm lg. ad basin dissecto coronata. Plantae caulibus prope basin valde lignescentibus.

Typus sectionis: *Trichanthemis Litwinowii* (Krasch.) Tzvel.

32. XYLANTHEMUM Tzvel. gen. nov.

Calathidia in apicibus ramorum solitaria, longe pedunculata, homogama; involucra semiglobosa vel breviter cylindracea, 4–8 mm in diam. et 4.5–8 mm alt., phyllis coriaceo-herbaceis, imbricatis, 4–5-serialibus, exteris ovatis vel late lanceolatis, apice obtusiusculis, margine angustissime hyalinis, internis late linearibus, vulgo triplo-quadruplo longioribus, margine late hyalinis; receptaculum planum vel subplanum, glabrum; flores disci tubulosi, hermaphroditi, flavi, corollis, 2.6–3.2 mm lg., tubo corollae longo et angusto; antherarum appendices apicales lanceolato-ovatae, obtusiusculae; rami stylorum lineares, truncati. Achenia conformia, glabra, subteretia, 1.5–3.5 mm lg. et circa 0.6–0.7

mm lt., costis longitudinalibus 5–6 percursa, pappo secundo, auriculiformi 1.2–2.2 mm lg., integro vel usque ad basin dissecto coronata. Plantae perennes; caules prope basin lignescentes, ramosissimi, superne simplices, calathidiorum pedunculis longis terminatis; folia alterna, basalia, cito emortua, caulina sat numerosa, parva laminis pinnatisectis.

878 Typus generis: *Xylanthemum Fischerae* (Aitch. et Hemsl.) Tzvel. A generibus proximis *Tanacetum* L., *Cancrinia* Kar. et Kir. et *Trichanthemis* Rgl. et Schmalh. differt: a primo calathidiis homogamis, receptaculo plano, acheniorum pappo auriculiformi et habitu; a secundo—pappo auriculiformi, receptaculo plano, involucris angustioribus phyllis internis exteris multo longioribus et caulibus basi valde lignescentibus, a tertio-acheniis glabris, pappo auriculiformi et habitu.

33. PSEUDOHANDELIA Tzvel. gen. nov.

Calathidia 20–100, breviter pedunculata (pedunculis ad 1.5 cm lg.), in corymbum umbelliformem dense congesta, homogama; involucria semiglobosa, 6–9 mm in diam. et 3–5 mm alt., phyllis herbaceis, subaequilongis, exteris et mebiis oblongis margine late hyalinis, internis angustioribus margine angustissime hyalinis bracteiformibus; receptaculum valde convexum, obtuse, conicum, glabrum; flores omnes tubulosi, hermaphroditi; corollae flavae, 1.8–2.5 mm lg., tubo longo et angustissimo, breviter glanduloso-piloso, in parte superiore subito campanulato-dilatato, quinquentatae, dentibus lanceolato-triangularibus patentibus tubo 7–8-plo brevioribus; antherarum appendices apicales ovato-lanceolatae, obtusiusculae; rami styli lineares, truncati. Achenia conformia, subteretia, arcuate curvata, sat copiose et breviter glanduloso-pilosa, 1.8–2.4 mm lg. et circa 0.3 mm lt., nervis longitudinalibus 4–5 percursa, epapposa. Plantae monocarpicae biennes vel perennes, laxe arachnoideo-tomentosae; caules erecti, simplices (inflorescentia exclusa) 20–100 cm alt.; folia alterna, laminis bipinnatisectis.

Typus generis (species unica): *Pseudohandelia umbellifera* (Boiss.) Tzvel.

A generibus proximis *Tanacetum* L. et *Cancrinia* Kar. et Kir. differt: a primo-calathidiis homogamis, acheniis epapposis glanduloso-pilosis et forma corollarum florum, a secundo-acheniis epapposis glanduloso-pilosis, receptaculo plano, phyllis involucri subaequilongis et habitu.

TANACETUM L.

34. Sect. **Asterotricha** Tzvel. sect. nova.—Plantae herbaceae, pilis accumbentibus stellatis dense tectae, 5–30 cm alt.; caules parce foliati. Calathidia solitaria, heterogama; involucria 3.5–10 mm in diam., phyllis internis externis duplo vel triplo longioribus; receptaculum subplanum; flores marginales ligulati flavi: flores disci tubulosi flavi. Achenia 2–3.2 mm lg., nervis 5–6 longitudinalibus percursa, pappo 0.2–0.3 mm lg., irregulariter obtuse lobato.

Typus sectionis: *Tanacetum Walteri* (Winkl.) Tzvel.

35. **T. ulutavicum** Tzvel. sp. nova.

879 Planta 12–25 cm alta, pilis bifurcatis (et partim simplicibus) sparse tecta; caules erecti vel basi ascendentes, parce foliati, simplices vel supra medium plus minusve ramosi; folia sparse pilosa, radicalia ad 8 cm lg. et 1.3 cm lt., longe pedunculata, laminis ambitu late linearibus pinnatisectis, segmentis pinnatilobatis vel pinnatifidis, lobulis terminalibus ad 1.5 mm lt., breviter acutatis. Calathidia solitaria vel 3–5, longe pedunculata (pedunculis ad 8–10 cm lg.); involucria 6–11 mm in diam. et 4.5–6 mm alt., subglabra vel sparse pilosa, phyllis coriaceoherbaceis, exteris lanceolato-ovatis, internis lanceolato-oblongae sesqui vel duplo longioribus, omnibus margine sat late membranaceis; flores marginales subligulati vel tubulosi, disci tubulosi. Achenia 1.8–2.5 mm lg. et circa 0.6 mm lt., nervis 6–9 longitudinalibus percursa, pappo circa 0.3 mm lg. margine irregulariter dentato.

Habitat: in decliviis lapidosis et saxosis montium Ulutau.

Typus: Prov. Karaganda, distr. Karsakpaj, in declivitate montis Kazantau non procul a pag. Ulutavskoe, 12 VII 1929, n° 298, I. Schipezinski. In Herb. Inst. Bot. Akad. Sc. URSS (Leningrad) conservatur.

A speciei proxima *T. achilleifolia* (M.B.) Sch. Bip. pubescentia sparsiore, calathidiis majoribus, foliis minus dissectis et floribus marginalibus tubulosis vel subligulatis differt.

T. canescens ssp. *erivanense* Tzvel. ssp. nova.—A typo segmentis foliorum minus numerosis et minus dissectis apice acutiusculis differt.

Typus subspeciei: In viciniis urb. Erevan prope pag. Dzhirvicz. V 1922, A. Grossheim.

T. myriophyllum ssp. *borshomicum* Tzvel. ssp. nova.—A typo pedunculis in parte superiore et involucriis multo laxius tomentosius differt.

Typus subspeciei: Distr. Borshomi, in declivitate saxosa inter st. Sakogavi et pag. Sakogavi, 14 VI 1918, V. Koslovski.

DENDRANTHEMA (DC.) Des Moul. emend. Tzvel.

36. **D. sichotense** Tzvel. sp. nova.—*Chrysanthemum sibiricum* var. *alpinum* Nakai in Tokyo Bot. Mag. XXXI (1917) 109.—*Ch. Zawadskii* var. *alpinum* (Nakai) Kitam. in Acta Phyt. et Geob. VII (1938) 210.

Planta perennis, 10–25 cm alta; caules erecti, foliosi, simplices vel pauciramosi (ramis 1–2); folia laxe tomentosa griseo-viridia, radicalia et caulina inferiora numerosa, ad 4 cm lg. et 2 cm lt., longe petiolata; laminae ambitu a reniformibus ad subrotundas, bipinnatifidae, segmentis e quovis latere 2–3, lobulis terminalibus anguste linearibus (ad 1 mm lt.), apice longe et sensim acutatis; folia caulina media et superiora minora, breviter petiolata vel sessilia, minus dissecta. Calathidia vulgo solitaria, rarius 2–3, sat magna; involucra 12–18 mm in diametro et 4.5–6 mm alt., extus lanuginoso-tomentosa, phyllis margine late hyalinis et nigrofuscis; flores ligulati rosei, ligulis 12–24 mm lg.; flores tubulosi flavi. Achenia 1.5–2.5 mm lg., pappo nullo (tab. XVI, fig. 1).

H a b i t a t: in declivitatibus lapidosis et rupibus montium Sichote-Alinj Oriens Extremus) supra 1200 m s. m.

T y p u s: Oriens Extremus. Montes Sichote-Alinj (pars australis) in monte Snezhnaja, alt. circa 1500 m s. m. 15 VII 1930, n° 767, I. Schischkin. An Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

A specie proxima *D. Maximowiczii* (Kom.) Tzvel. pubescentia, forma foliorum radicalium et phyllis involucri margine late nigrofuscis bene differt

37. Sect. **Arctanthemum** Tzvel. sect. nova.—Antherarum appendices apicales oblongae, apice late rotundatae; receptaculum glabrum. Achenia sine cellulis muciferis. Plantae glabrae vel subglabrae, rhizomate incrassato, laminis foliorum crassiusculis plus minusve lobatis vel dissectis.

Typus sectionis: *Dendranthema arcticum* (L.) Tzvel.

38. Sect. **Haplophylla** Tzvel. sect. nova.—Antherarum appendices apicales oblongae, apice late rotundatae; receptaculum parce pilosum. Achenia sine cellulis muciferis. Plantae humillimae, caulibus subaphyllis, foliis radicalibus numerosis integerrimis anguste linearibus.

Typus sectionis (species unica): *Dendranthema integrifolium* (Richards.) Tzvel.

BRACHANTHEMUM DC.

39. Sect. **Dendranthemopsis** Tzvel. sect. nova.—*Brachanthemum* ser. *Pyrethroidea* Krasch. Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XI (1949) 196, diagn. russk.—Calathidiorum involucri semiglobosa phyllis internis exteris duplo-triplo longioribus; receptaculum subplanum, breviter et parce pilosum; corollae florum ligulatorum albae, ligulis 6–8 mm lg.; antherarum appendices apicales ovato-lanceolatae.

Typus sectionis (et species unica): *Brachanthemum Baranovii* (Krasch. et Poljak.) Krasch.

AJANIA Poljak.

40. **A. trilobata** Poljak. sp. nova in litt.

Haec species *A. Scharnhorstii* (Rgl. et Schmalh.) Tzvel. proxima, sed caulibus validioribus (5–15 cm altis), calathidiis magis numerosis (vulgo 3–10 in corymbo) et minoribus (vulgo 5–7 mm in diametro) differt.

Habitat: in decliviis glareosis et lapidosis supra 2500 m s. m. montium Tjanj-Schanj.

Typus: Tjanj-Schanj centralis, in systemate fluminis Sary-Dzhas, in decliviis infra Nansen-montem, alt. 2950 m s. m., 29 VII 1955, M. Grudzinski. In Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

41. TURANIPHYTUM Poljak. gen. nov.

Calathidia heterogama in numero 6–18 in glomerulos subglobosos dense congesta, rarius partim solitaria; involucri oligophylla, phyllis subaequilongis, internis carinatis scaphoideis; receptaculum convexum semisphaericum, glabrum, flosculi disci staminati, pistillo rudimentali, corolla tubulosa, superne sat sensim dilatata, quinquedentata, apice longe et rigide pilosa, plus minusve roseola; antherae appendices superiores oblongae apice attenuatae; pistillum rudimentale apice integrum conicum; flosculi radii pistillati, fertiles, in phyllis involucri scaphoideis dispositi, corolla parva, late tubulosa, apice inaequaliter crenata; pistillum apice bifidum, ramis linearibus divergentibus; achenia ovata, brunnea, epapposa. Plantae perennes sat longe et molliter pilosae; folia pinnatisecta; glomeruli et calathidia solitaria in inflorescentia spiciformi interrupta congesti.

Typus generis: *Turaniphytum eranthemum* (Bge.) Poljak. comb. nova-*Artemisia eranthema* Bge.

A f f i n i t a s: Hoc genus a genere *Artemisia* L. flosculis radii in involucri phyllis scaphoideis dispositis et calathidiis vulgo in glomerulos dense congestos differt.

42. **T. kopetdaghense** Poljak. sp. nova.

Planta perennis, incano-viridis. pilis sat longis mollibus dense tecta; radix crassa, sublignosa; surculi abbreviati, caespites humiles compactos formantes; caules plus minusve numerosi, 15–25 cm alt., erecti vel basi ascendentes, semper simplices, parce foliosi; folia radicalia longe petiolata, 3.5–6 cm lg., 1.2–1.5 cm lt., ambitu oblonga, bipinnatisecta, lobis primariis 2–3-jugis, remotis; lobulis 3–5 mm lg. et 0.4–0.6 mm lt., linearibus, acuminatis; folia caulina minora, sessilia vel subsessilia, pinnatisecta; folia suprema parva, linearia. Inflorescentia spicata, interrupta; calathidia sessilia, ovata vel subglobosa, 2–2.5 mm lt., in inflorescentiae parte superiore plus minusve conferta; involucrium oligophyllum; flosculi disci in numero 16–18, radii in numero 8–9 in involucri phyllis scaphoideis dispositi. Achenia 1.2–1.4 mm lg. et circa 0.6 mm lt.

T y p u s: speciei. Turcomania, distr. Aschhabad, montes Kopetdagenses, 2 km versus orient. a pag. Sybir, 2600–2400 m s. m., 24 VIII 1947, V. Nikitina. In Herb. Inst. bot. Ac. Sc. URSS (Leningrad) conservatur.

A f f i n i t a s: A. *T. eranthemo* (Bge.) Poljak. calathidiis multo majoribus et in glomerulos subglobosos non congestis, floribus 20–30 (non 2–10) constantibus differt.

SENECIO L.

43. **S. ferganensis** Schischk. sp. nov. (Sect. *Jacobaea* DC. Prodr. VI (1837) 348).

Biennis; caulis erectus, superne ramosus, ramis oblique sursum directis unacum foliis araneoso-flosculosus, 60–75 cm altus; folia bipinnatim secta, radicalia et caulina infima cito marcescentia caulina media numerosa anguste ovata, sessilia basi dilatata et auriculis vix evolutis munita, 6–15 cm longa et 1.5–2 cm lata. Inflorescentia corymbosa, ramis oblique sursum directis; calathidia numerosa in numero 15–30, involucrium late campanulatum 5 mm longum et 10 mm latum, foliola involucri externa 3–5, linearia, interioribus adpressa vel leviter patentia, duplo triplove interioribus breviora, interiora anguste ovata, acutiuscula vix araneosa vel glaberrima; ligulae luteae involucri duplo longiores, achenia glabra ad 2 mm longa. Fl. VI–VII.

T y p u s: Asia Media. Jugum Alaicum, in faucibus fluminis Czirczik, in clivo montis supra ripam. Fl. 11 VII 1930 n° 295. *S. Juzepczuk*; in Herb. Inst. bot. Ac. Sc. URSS conservatur.

882 **A f f i n i t a s:** Nostra species nova appropinquat ad *S. borysthenicum* Andrzej sed foliis bipinnatim (nec tripinnatim) sectis et acheniis disci glaberrimis (ne pilosis) sa discrepat.

44. *S. massagetovii* Schischk. sp. nov. (Sect. *Incani* DC. Prodr. V (1837) 355).

Radix 0.5 cm crassa; caulis solitarius tomento araneoso leviter detergibilis tectus, costatus, superne ramosus, 50–75 cm altus; folia radicalia et caulina infima petiolata, petioli dilatati laminae aequales vel ea longiores, lamina ovato oblonga 6–20 cm long. et 3–10 cm lata, supra fuscoviridia, subglabra, subtus breviter et dense araneosa, lyratopinnata, lobis 2–3, distantibus, deorsum deminutis, inaequaliter dentatis; lobus supremus ceteris major; folia caulina media radicalibus similia, sed sessilia et auriculis semiamplexicaulibus instructa. Calathidia numerosa (10–40), inflorescentiam laxam corymbosam-paniculatam formantia pedunculi calathidiis aequales vel eis multo longiores; involucrium floso-araneosum, 6–10 mm longum et 10 mm lat., foliola involucri externa anguste linearia, in numero 1–5, internis duplo breviora (interdum nulla), foliola interna oblongo-linearia, dorso carinata, ligulae luteae in numero 13–15, 10 mm longae, 2–3 mm latae, achenia cylindrica glabra, vix costata, 4–4.5 mm longa. Fl. VI–VII.

T y p u s: Grusinskaja SSR, In faucibus fluminis Borzhomka prope stationem viae ferreae Sakocavi, in saxosis 25 VI 1934 P. Massagetov; in Herb. Inst. bot. Ac. Sc. URSS conservatur.

A f f i n i t a s: Nostra species nova valde affinis *S. Lorentii* Hochst. et *S. Lipskyi* Lom., sed ab ambabus involucri 10 mm latis (nec 12–15 mm), calathidiis numerosis usque ad 40 (nec 10–25) distinguitur.

45. *S. iljinii* Schischk. sp. nova. (Sect. *Pseudooliganthi* Sof. in Izv. Ak. Nauk Azerb. CCP (1957) 88).

Ut videtur, perennis, radix deficiens; caulis erectus, intus solidus, pilis albis, brevibus, crispatis tectus, 40–50 cm altus, dense foliosus; folia ovata, sessilia vel petiolis brevibus instructa, acuta, marginibus grandidentata, dentibus vulgo obtusis, supra fusco-viridia, infra pallidiora, subglabra vel vix araneosa, 8–12 cm longa et 3–5 cm lata. Inflorescentia paniculata, polycephala pedunculi densiuscule albotoментosi; involucrium 5 mm longum ac latum, foliola involucri externa in numero 3–4, linearia, internis vix longiora et eis appressa, foliola interna ovoidea, apice acutiuscula, in numero 8–10, dorso breviter crispule pubescentia, marginibus ciliata; ligulae 8, luteae, involucri

triplo longiores; achenia juvenalia glaberrima, 3–4 mm longa. Fl. VIII.

T y p u s: Kazachskaja SSR. Districtus Dzharkend apud flum. Tyschkan. Fl. 8 VIII 1910—A. Michelson; in herb. Inst. bot. Ac. Sc. SSSR conservatur.

A f f i n i t a s: Nostra species affinis est *S. nemorensi* L. sed foliis marginibus grosse dentatis, dentibus inaequalibus, obtusis (nec dentibus aequalibus acutis), pedunculis dense albo tomentosis (nec subglabris).

46. Sect. 7. **Extremiorientales** Schischk. sect. nov.—Plantae
883 perennes, 1–2 m alt., foliis digitatis vel integerrimis, basi saepe auriculis magnis instructis; calathidia numerosa parva, involucrium ad 5 mm longum ac latum; achenia glabra 3–5 mm longa.

Duae species extremiorientales: *S. cannabifolius* Less. et *S. Litvinovii* Schischk. Typus sectionis: *S. cannabifolius* Less.

47. Sect. 8. **Carniolicus** Schischk. sect. nov.—Folia radicalia diu persistentia, pinnatim incisa, lobis late linearibus, foliola interna involucri apice macula nigra instructa. Ligulae luteae 2–4, achenia glabra, pappus sordide fuscus.

Sect. monotypica: *S. carniolicus* Willd.

48. Sect. 9. **Montani** Schischk. sect. nov.—Folia radicalia petiolata, petioli laminae aequales vel ea duplo triplove longiores ovoidea, dentibus majusculis inaequalibus vel folia pinnatim secta; foliola involucri externa linearia in numero 2–8, ligulae flavae in numero 10–12; achenia glabra.

Duae species: *S. tianschanicus* Rgl. et Schmalh., *S. Renardii* Winkl. montibus Asiae Mediae propriae. Typus sectionis: *S. tianschanicus* Rgl. et Schmalh.

49. Sect. 10. **Scaposi** (Hoffm.) Schischk. ex Krylov Flora Zap. Sib. XI (1949) 2890.—*Scaposi* Hoffm. in Engl. Pflanzenf. 4.5 (1889) 297 part.

Plantae perennes, humiles, semper monocephalae, folia pinnata vel lyrata; tota planta glaberrima.

Duae species: *S. residifolius* Less. et *S. carpathicus* Herb. Typus sectionis: *S. resedifolius* Less.

50. Sect. 11. **Karelinoidei** O. et B. Fedtsch. IV (1911) 220 nom. nud.—Plantae perennes, folia subintegerrima ovata vel ovato-lanceolata; foliola involucri interna in numero 8, externa 1–2, vel interdum deficientia, ligulae luteae in numero 3–5.

Sectio monotypica: *S. karelinoides* Winkl. Asiae Mediae propria.

51. *S. amurensis* Schischk. sp. nov. (Sect. *Tephroseris* (Rchb.) DC. Prodr. VI (1837) 359).

Perennis; radix fibrillosa; caules solitarii vel 2–3, erecti, intus solidi, arachnoideo-albo-pubescentes (10)20–60 cm alti; folia radicalia ovata, anguste ovata vel interdum lanceolata, obtusa vel acutiuscula, basi in petiolum latum angustata, supra et subtus araneoso-pubescentia, marginibus dentibus minimis nigris distantibus instructa; lamina 1.5–8 cm longa et 1–5 cm lata; caulina non numerosa, ad apicem caulis gradatim deminuentia, infima caulina radicalibus similia, breviter petiolata, cetera sessilia basi amplexicaulia, lanceolata, acuta 4–8 cm longa et 1–1.5 cm lata, suprema lanceolato-lineararia minora. Calathidia in numero 3–10 inflorescentiam umbelliformem formantia, pedunculi araneoso-pubescentes, vulgo calathidiis multo longiores, basi umbellae
884 foliis linearibus parvis munitis, foliola involucri unifaria, involucrum late campanulatum, 6–7 mm longum et 10 mm latum; ligulae pallide flavae, oblongae, in numero 12, 10 mm longae et 2–2.5 mm latae; ovarium et fructus pubescentes. Fl. V–VI.

T y p u s: Sibiria orientalis, in pratis siccis silvaticis prope oppidum Blagovesczensk V–VI 1903 fl. F. Karo.

A f f i n i t a s: Nostra species nova valde affinis *S. Karelinii* sed differt ab eo foliis dentibus vulgo nigris minimis distantibus instructis, nec dentibus deficientibus.

52. *S. lenensis* Schischk. sp. nova (Sect. *Tephroseris* (Rchb.) DC. Prodr. VI (1837) 359).

Rhizoma adscendens, 8–10 mm crassum, radicibus numerosis tenuibus tectum; caulis glaber vel floccoso pubescens, in dimidio inferiore aequifoliosas, in dimidio superiore fere efoliatus, intus cavus, tenuiter costatus, 25–50 cm altus; folia radicalia petiolata, petiolis lamina brevioribus vel vix longioribus, lamina ovata vel lanceolato-ovata, 4–6 cm longa et 1.5–3 cm lata, apice obtusa vel acuta, marginibus dentibus parvis nigris distantibus instructa, glabra vel floccoso-pubescens; folia caulina inferiora radicalibus angustiora, rite lanceolata, acuta vel interdum acuminata. sessilia rarissime \pm longe petiolata, 4–12 cm longa et 0.5–2 cm lata superne fere lineararia, parvula. Inflorescentia umbellata, calathidiis 3–7 plus minusve longe pedunculatis; involucrum unifarium, 5–8 mm longum et 10–15 mm lata, foliola leviter pilis brevibus tecta, lanceolato-lineararia, apice tenuiter acuminata et hic nigrescentia; ligulae luteae, interdum durantiacae 12 mm longae et 3 mm latae, in numero ad 12; achenia 2–3.5 mm longa, pilis brevibus mollibus pubescentia. Fl. VII.

T y p u s: In valle fluminis Lenae prope Bulun. fl. 3 VII 1914. V. Kaschkarov.

A f f i n i t a s: Nostra species nova *S. lenensis* Schischk. affinis est *S. Sukaczewii* Schischk. sed foliolis involucris apice maculis nigriusculis munitis (nec deficientibus) et seminibus hirsutis (nec glabris) differt.

53. *S. aquilonaris* Schischk. sp. nov. (Sect. *Tephroseris* (Rchb.) DC. Prodr. VI (1837)359).

Perennis, rhizoma sat longum, 3–8 mm crassum, radicibus longis, tenuibus, non multis obsitum; caules erecti vel vix flexuosi, simplices, pauci vel solitarii, vulgo violaceo-colorati, costati, leviter araneosi vel subglabri, 20–30 cm alti; folia radicalia petiolata, petiolis dilatatis, lamina brevioribus vel longioribus, lamina ovata vel interdum oblonga, apice obtusa vel acutiuscula, marginibus dentata, dentibus late triangularibus, brevibus, acutis, non multis, rarius integerima, supra et subtus glabra, 2–7 cm longa et 1–2.5 cm lata; folia caulina in numero 2–4, sessilia, amplexicaulia, lanceolata marginibus integerrima, glabra, 3–6 cm longa et 0.8–1.2 cm lata, suprema minora. Calathidia in apice caulium in numero 2–5 raro solitaria, pedunculi breves dense araneoso-pubescentes; involucrium 10–12 mm longum et 12–15 mm latum, unifarium, foliola involucris lanceolato-linearibus, fusco-purpurea, tomento reticulato griseolo tecta; ligulae in numero 10–12, luteae, involucri 1½-plo longiores, 3–4 mm latae, non raro ligulae deficientes; achenia cylindrica, glaberrima, 3–5 mm longa, pappus achenio duplo triplove longior. Fl. VI–VII.

T y p u s: Ad litus maris orientali-sibirici. In valle amnis Medveshja, prope ostium. Fl. 8 VIII 1950. G. Nepi.

A f f i n i t a s: Nostra species affinis *S. Sukaczewii* Schischk. sed involucri tomento griseolo reticulatim tecto (nec glabro vel vix araneoso) statim dignoscitur.

54. *S. igoschinae* Schischk. sp. nov. (Sect. *Tephroseris* (Rchb.) DC. Prodr. VI (1837) 359.

Perennis, rhizoma horisontale, longum, caulis glaber, 30–40 cm alt.; folia radicalia in numero 2–3 et caulina inferiora lamina duplo triplove longiora, lamina anguste ovata, 2–5 cm long. et 0.7–1.5 cm lata, apice rotundata, basi cuneatim angustata, glabra, marginibus breviter dentata vel integerrima, folia caulina media lanceolata, acutiuscula basi sensim in petiolum angustata, laminae aequale, folia suprema linearibus, integra. Calathidia in numero 5 inflorescentiam umbelliformem formantia; involucrium 5 mm longum et 10 mm latum, unifarium, foliola involucris linearibus subglabra vel vix pubescentia;

ligulae luteae, involucro duplo longiores, in numero 15; achenia cylindrica, ad 4 mm longa, glabra vel interdum puberula. Fl. VI–VII.

T y p u s: Montes uralenses australes, prope pag. Machmutovo non procul a flumine Belaja in pratis montanis. Fl. 23 VI 1957. K. Igoschina.

A f f i n i t a s: Valde affinis *S. Reverdattoi*, sed foliolis involucris viridibus (nec nigro-violaceis), ligulis vitellinis (nec aurantiacis) discrepat.

55. ***S. tichomirovii*** Schischk. sp. nov. (Sect. *Tephroseris* (Rchb.) DC. Prodr. VI (1837) 359).

Perennis; rhizoma abbreviatum, ascendens; caules solitarii, erecti, crassiusculi, 4–6 mm in diametro, 10–15 cm alti, a basi usque ad dimidium glabri, superne, pilis hepaticis araneoso-tomentosi, folia radicalia 4–6, longe petiolata, petiolis lamina duplo triplove longioribus, lamina anguste ovata 3–4 cm longa et 0.5–1.5 cm lata, glabra, pallidiviridia, apice acutiuscula, marginibus dentata, dentibus crassiusculis callosis distantibus; folia caulina radicalibus similia, sed sessilia et amplexicaulia, glabra, folia suprema minora et ut caulis dense tomentosa. Calathidia in apice caulis solitaria; involucrum 1.5 cm longum et 2.5 cm latum, foliola involucris uniserialia, ut caulis, dense villosa-tomentosa, pili fusco-flavus-culo-hepatici, ligulae fusco-flavae lineares in numero 20–25, involucro duplo longiores. Fl. VII–VIII.

T y p u s: Peninsula Czukotka, in tundra fl. 20 VIII 1958. Leg. B. Tichomirov.

A f f i n i t a s: Affinis est *S. atripurpureo* (Ldb.) B. Fedtsch. sed ligulis sordide purpureis (nec luteis vel aurantiacis) involucro 1.5 cm longo et 2.5 cm lato, caule superne pilis hepaticis araneoso-tomentoso nec pilis albis vel atri-purpureis statim dignoscitur.

LIGULARIA Cass

56. **Subgenus Ligularia**—Syn. cfr. supra 797.—

Rhizoma abbreviatum incrassatum radices numerosas chordoideas emittens. Calathidia parva, mediocria vel magna, involucro quinque—polyphylo, phyllis saepissime inter se liberis, sed raro (subsect. *Stereochaete* series *Schmidtianae*) in cyathium apice paucidentatum connatis. Florum disci styli ramuli apice angustati aut appendice brevi, conica vel subplana, apice rotundata vel acutata acuti; stigmata (proprio sensu) ramulorum totam faciem superiorem occupantia aut strias marginales continuas, latiusculas, prominulas, usque ad appendicis basin extensas formantia; pili ad paginam inferiorem infra medium vel saepe

ad basin, rarius sub appendice tantum siti. Antheropodium filamento paulo vel distincte latius. Pappi setae achenio saepissime subaequilongae tenues, scabrae vel brevissime barbellatae, aut raro (Sect. *Senecillis*) breviusculae vel brevissimae, achenio multo breviores, manifeste barbellatae.

Typus subgeneris—*L. sibirica* (L.) Cass.

57. *L. trichocephala* Pojark. sp. nova.—*L. Hodgsonii* var. *sachalinensis* Nakai in Tokyo. Bot. Mag. XXIV (1910) 264 (non *L. sachalinensis* Nakai (1944.—*L. calthaeifolia* auct. non Maxim. (1870): Sugaw. Ill. Fl. Saghal. IV (1940) 1857.

Caulis superne, rarius ad basin pilis crassiusculis fuscis et praeterea albis arachnoideis vestitus. Folia plerumque rotundato-vel triangulari—cordata, rarius subhastata vel subreniformia, apice saepe mucronulata. Inflorescentia subcorymbosa vel racemosa, pedunculis inferioribus ad 11–13 mm longis, ut folia pedunculos fulcrantia albo-arachnoideis et pilis fuscis crassiusculis tectis. Calathidia sat magna, involucrio 10–15 mm longo, 10–18 mm lato. Reliqua *L. Hodgsonii* Hook.

Habitat: in pratis paludosis et in betuletis humidis ins. Sachalin et Moneron.

Typus: Sachalin australis in vicinitate opp. Jushno-Sachalinsk, in angustis Tankovoje jugi Sudzusi, in declivibus montium, 600–700 m s. m., 28 VII 1948, fl., M.G. Popov. Typus et isotypus in Herb. Inst. Bot. Acad. Sc. URSS in Leningrad conservantur.

Affinitas: A proxima *L. Hodgsonii* Hook. bene differt caulibus pedunculis, foliis floralibus nec non involucri phyllis pilis fuscis crassiusculis vestitis.

58. Sect. **Ligularia**.—Syn. cfr. supra 801.

Calathidia in inflorescentiam simplicem racemosam aggregata (pedunculi infimi nonnunquam calathidia 2–3 ferunt). Folia pedunculos fulcrantia sat magna, saepe colorata, squamiformia, inferiora saltem naviculiformia petiolum et non raro involucrium amplectentia. Pappi setae brunnescentes vel rufescentes. Floribus disci vel eius parte tubuloso subaequilongae. Antheropodium filamento paulo latius; styli 887 rami apice angustati vel appendice acutata vel rotundata aucti; stigmata ramorum totam paginam superiorem occupantia. Calathidia mediocria, involucriis angustis cylindraceis campanulatisve.

Typus sectionis—*L. sibirica* (L.) Cass.

Spesis sectionis Ligulariae Asiae austro-orientalis, orientalis, borealisque nes non Caucasi et Europae incolae sunt.

59. Series **Speciosae** Pojark. ser. nova.—Pappi setae breviusculae florum disci parte tubuloso aequilongae vel vix longiores.

Typus seriei—*L. Fischeri* (Ldb.) Turcz.

Species Sibiriae orientalis, Orientis extremi (Korea, Mandshuria et Japonia inclusae) nec non China temperatae incolae.

Series Racemosae Kitam. Comp. jap. III (1942) 190, p. min. p. emes Pappi flori corollae aequilongae vel vix breviores. Plantae pro norma altae, caulibus robustis, foliis magnis, calathidiis numerosis.

Typus seriei—*L. sibirica* (L.) Cass.

Area geographica seriei: Asiae regiones temperatae, Caucasus, montes Europae centralis occidentalisque.

61. *L. abakanica* Pojark. sp. nova.—*Cineraria sibirica* auct. non L. (1763); Ldb. Fl. alt. IV (1833) 102, p. p. et excl. syn.—*L. sibirica* var. *hirsuta* Serg. in Kryl. Fl. Zap. Sib. XI (1949) 2861.

Rhizoma abbreviatum radicibus crassiusculis funaliformibus, superne residuis fibrosis petiolorum annorum priorum dense vestitum. Caules 1–2, erecti 20–70 cm alti, 3.5–8 mm lati, robusti, a basi ob pilos fuscescentes perplexos villosi vel tomentosi. Folia in sicco rigidiuscula, subtus dense vel densiuscule fusco pubescentia, margine plus minusve regulariter acute et plerumque crebre dentata, radicalia 1–3, saepius 2, late cordata vel triangulari-cordata, saepe longa quam lata, rarius cordato-reniformia, 6.5–12 cm longa, 7–40 cm lata, apice breviter acutata vel obtusa, basi plerumque anguste et profunde, rarius lata incisa, petiolo crassiusculo, quam lamina sesqui—duplo longiore, sed nonnunquam ei aequilongo vel paulo brevior, pubescentia fusca, patenti, villosa vel tomentosa vesito; folia caulina 1–3, saepius 2, inferiora radicalibus conformia, sed interdum brevius petiolata, petiolo basi anguste vaginato; folium supremum lamina parva triangulari, petiolo brevi in vaginam amplam inflatam dilatato, folia sub inflorescentiam plerumque 1–3 in numero, ovata sessilia amplexicaulia, foliis pedunculos fulcrantibus conformia sed majora. Calathidia 7–12 in numero, in inflorescentiam racemosam, 6.5–20 cm longam, ellipticam vel oblongam, compactam aggregata; pedunculi crassiusculi, superiores 2–8 mm longi, inferiores 10–12 mm raro 3–5(6) cm longi et interdum calathidia 2–3-ferunt, omnes pilis longis fuscis multicellularibus et insuper albis arachnoideis dense vestiti; folia pedunculos fulcrantia omnia lata, ovata, sessilia, extus praecipue ad margines alboarachnoidea, plus minusve anthocyano colorata, apice non raro acute dentata, inferiora 2–4 cm longa, naviculiformia, superiora plana involucre sublongiora; calathidia cum ligulis 3.5–4.5 cm diam., involucrem basi foliis 2–3 fulcrantibus ei subaequilongis, linearibus vel lineari-lanceolatis praeditum, late campanulatum, basi pilosum, indistincte biseriale, phyllis (7)9–11, glabris vel parce araneosis 9.5–11 mm longis, dimorphis interioribus 3–4 mm latis, sat breviter acutatis, late scarioso-

marginatis, exterioribus duplo angustioribus, lanceolato-linearibus, margine scarioso nullo vel angusto. Flores marginales 7–12, ligulis oblongis vel obovato-oblongis 15–20 mm longis 4–6 mm latis, nervis (5)7–10, tubo 5–6.5 mm longo; flores disci 26–42, corolla 7.5–9 mm longa, tubo breviusculo 2.75–3.5 mm longo, parte dilatata campanulata vel rarius anguste campanulata, 4.5–5 mm longa, dentibus oblongo-triangularibus; pappus albido-fuscus, corolla subbrevior; antherae basi sagittatae, auriculis breviusculis subulatis appendice apicali ovato-lanceolata; antheropodium haud latum; styli ramuli planiusculi, apice spathulatim dilatati, rotundati, extus ad basin pilosi. Achenia angusta, cylindracea, brunnescentia, 5 mm longa, pappo acheniis subaequilongo.

Habitat: in pratis humidis necnon ad ripas paludosas fluviorum lacuumque Sibiriae: in regionibus montanis et praemontanis jugorum Altai, Kuznetzki et Abakanski.

Typus: Sibiria centralis (distr. Minussinsk) in valle fl. Uibat, in pratis humidis, 1(14) VIII 1909, fl. V. I. Smirnov. Typus et isotypus in Herb. Inst. Bot. Acad. Sc. URSS in Leningrad conservantur.

Affinitas: *L. subsagittatae* Pojark. praecipue similis, a qua notis sequentibus differt: foliis radicalibus latioribus et ut caulis densius pubescentibus, foliis pedunculos fulcrantibus omnibus ovatis (nec lanceolatis vel linearibus), florum radii ligulis (5)7–10-nerviis (nec 4–5-nerviis), florum disci parte angustata quam dilatata 1.5–1.75-plo brevior (non subaequilonga).

62. *L. sichotensis* Pojark. sp. nova.

Rhizoma speciei praecedentis; caulis 18–80 cm longus, 2–3.5 cm crassus, plus minusve purpureo coloratus, ut pedunculi glaber vel pilis patentibus perplexis fuscis vestitus. Folia in sicco rigida subcoriacea, supra laete viridia, subtus albido-glauescentia, utrinque glabra vel subtus ad nervos pilis crassiusculis haud dense obsita, radicalia petiolis luminis sesqui-duplo brevioribus vel eis subaequilongis, saepe tenuibus, laminis 5–11 cm longis et latis, cordatis vel orbiculato-cordatis, lobis basalibus breviusculis obtusis, apice rotundatis vel obtusis, margine non raro integerrimis vel emarginato-dentatis, dentibus latis vel nonnunquam obsoletis; folia caulina nulla vel solitaria, infra medium caulis disposita, lamina parvula 1.5–2 (rarius ad 4.5) cm longa petiolo brevi fere omnino in vaginam transformato, folia apicalia 1–4, foliis pedunculos fulcrantibus conformia. Inflorescentia simplex racemosa e calathidiis (1–3)5–10; pedunculi involucri vulgo breviores, 3–10 mm longi, rarius infimi 2–3.5 cm longi, ut rachis racemi plus minusve albo-arachnoidei et praeterea pilis patentibus breviusculis obsiti; folia pedunculos fulcrantia omnia angusta, sublinearia vel infima angustelanceolata, viridia vel purpurascentia, subaraneosa, pedunculis longiora,

889 infima tantum interdum eis breviora. Inflorescentia racemosa; calathidia cum ligulis 3.5–4 cm diam., involucri basi phyllis fulcrantibus binis eo subaequilongis instructo, campanulato vel campanulato-cylindraceo; involucri phylla 7–8, acuminata, (8)9–10 mm longa, biformia, interna ovata late membranaceo-marginata, externa lanceolata margine anguste marginata, dorso omnia glabra, vel interdum pilis crassiusculis parce obsita vel subaraneosa. Flores marginales (4)5–7, ligulis oblongis vel oblongo-ellipticis, 10–17 mm longis, tubo (5)7 mm longo, flores disci ad 20 in numero, corolla 8–9 mm longa, parte superiore longiuscule campanulata parte tubulosae subaequilonga; styli ramuli spathulato dilatati, apice rotundati, pappus corolla brevior. Achenia immatura 5–6 mm longa.

Habitat: in declivibus siccis lapidosis et herbosis, ad margines silvarum paludumque a maris litore usque ad regionem alpinam Orientis extremi. Planta declivi orientali montium Sichote-Alinj endemica.

Typus: Oriens extremus, regio Primorski, montes Sichote-Alinj: vallis fl. Botchi, in parte superiore fl. Jasy, in declivibus apertis, ad 1000 m s. m., 29 VII 1924, fl. I. Schischkin, n° 380. Holotypus in Herb. Inst. Bot. Acad. Sc. URSS in Leningrad conservatur isotypi—in Leningrad et in Valdivostok conservantur.

Affinitas: A *L. sibirica* (L.). Cass. foliis minoribus, saepe integerrimis, inflorescentia depauperata, e calathidiis (1–3)5–10 (nec 30–50) composita, calathidiis paucifloris, florum disci corollae parte dilatata late campanulata tubo aequilongo (nec tubuloso-campanulata tubo sesqui longiore).

63. *L. subsagittata* Pojark. sp. nova.—*Cineraria sibirica* auct. fl. cauc. non L. (1763).—*L. sibirica* auct. fl. cauc. non Cass. (1823).

Rhizoma abbreviatum radices crassiusculas numerosas emittens caulis basi residuis fibrosis tenuibus foliorum vetustorum cinctus, erectus, robustus, sulcato-costatus, glabratus, sub inflorescentia tantum (ut pedunculi) pilis patentibus crassiusculis brunnescentibus et praeterea albis araneosis sparse aut dense vestitus, 25–90 cm altus, 4–7 mm crassus. Folia supra saturati viridia, glabra, subtus pallidiora glaucescentia, tota pagina pilis brevioribus brunnescentibus densiuscule vel sparse obsita, textura saepe subcoriacea, radicalia 2–3, cordata vel cordato-sagittata, rarius triangulari-sagittata, 5.5–18(24) cm longa, 4.5–15 cm lata, sesqui (duplo) longiora quam lata, apice breviter acutata vel obtusa, basi profunde incisa, lobis basalibus majusculis, acutiusculis vel obtusis, deorsum spectantibus vel divergentibus, margine inaequaliter grandidentata, petiolo 1.5–2.5-plo lamina longiore, basi in vaginam haud longam breviusculam dilatato; folia caulina saepe 3, infimum radicalibus conforme, sed petiolo breviora, longius vaginato;

folium medium lamina minore petiolo ei subaequilongo, longe vaginato, folium superius parvulum, petiolo in vaginam amplam inflatam transformato; folia superma (1)2–6 sessilia, amplexicaulia, violaceo colorata, foliis pedunculos fulcrantibus similia sed majora. Calathidia 7–35, sub anthesi nutantia, inflorescentiam racemosam 4.5–30(34) cm
 890 longam formantia; pedunculi inferiores ad 3.5 cm longi, superiores 0.3–1 cm longi; folia pedunculos fulcrantia plus minusve fusco-violacea, glabra vel subaraneosa, lanceolata, longe tenuiterque acutata, inferiora 22–35 mm longa, naviculiformia, superiora minora, involucri sublongiora, nonnunquam linearia. Involucrum basi calyculi phyllis duobus linearibus eo subaequilongis instructum campanulato cylindraceum obsolete biseriale, phyllis 8–10, tenuibus chartaceis, pallidis, interdum plus minusve anthocyano coloratis, 10–12(14) mm longis, glabris aut parce pilis crassiusculis patentibus vel appressis arachnoideis tectis, dimorphis, internis lanceolatis, marginibus late membranaceis, externis angustioribus linearibus, non vel anguste membranaceis, omnibus longe acuminatis. Flores radii 7–12, ligulis aureo-luteis, 8–15 mm longis, 2.5–3.5 mm latis, nervis 4–5, tubo 4–5.5(7) mm longo; flores disci 17–32, corolla 8–11 mm longa, parte dilatata anguste campanulata, 3.5–5 mm longa, dentibus oblongo-triangularibus 1–1.5 mm longis, parte angustata 4–4.5 mm longa; stamina et styli ramuli speciei praecedentis; achenia anguste cylindracea, 5–6 mm longa, pappo subaequilongo albido-rufescenti.

Habitat: in pratis alpinis humidis fere toti Caucasi.

Typus: Caucasus Magnus: prope stationem Kazbek, in prato paludoso vallis fl. Terek in declivo occidentali montium, 10 VIII, 1916, P.N. Krylow et E.I. Steinberg. In Herb. Inst. Bot. Acad. Sc. URSS conservatur.

Affinitas: cfr. supra p. 888.

64. Series **Longipedes** Pojark. ser. nova.—Pappo setae florum disci corollae subaequilongae. Plantae pro norma humiles, caulibus, tenuibus, foliorum radicalium petiolis saepe longissimis, laminis parvis, 1.5–8(10) cm longis, saepissime sagittatis, lobis basalibus elongatis. Calathidia numerosa.

Typus seriei: *L. longipes* Pojark.

Species tres in Sibiria, Europa arctica et subarctica nec non in montibus Carpaticis distributae.

65. ***L. longipes*** Pojark. sp. n.

Rhizoma abbreviatum, incrassatum, radicibus numerosis funaliformibus, superne residuis fibrosis foliorum vetustorum dense obsitum; caules 30–65 cm alti, 1.5–2.5 mm diam., tenues, remote foliati,

tenuiter striati, glabri, subinflorescentia tantum pilosi, basi vel tota altitudine purpureo colorati. Folia supra laete viridia, subtus pallidiora, glaucescentia utrinque glabra, textura in sicco tenui sed rigidiuscula, margine sat regulariter emarginato-denticulata, dentibus latis triangularibus, in mucronem callosum subito contractis; folia radicalia 2–3(4), petiolis tenuissimis 0.75–2 mm crassis, glabris, longis, lamina 2.5–5-plo longioribus, non raro purpureis, laminis 2.3–8(10) cm longis, saepe elongatis, sagittatis vel triangulari-sagittatis, vel triangularibus, rarius reniformi-sagittatis vel reniformi-cordatis, apice plerumque acuminatis, rarius obtusis, basi profunde incisis, lobis basalibus saepe longis, non raro dimidio totae laminae aequilongis, rarius ad 1.5–2.5-plo ea brevioribus, apice acuminatis vel rotundatis; folia caulina 2 (rarius 3) valde remota, inferum radicalibus conforme, sed nonnunquam brevius petiolatum et latius vaginatum, superus lamina parvula, petiola in vaginam amplam inflatam dilatato; folia apicalia nulla aut 1–2(3), subsquamiformia, plus minusve purpurascens, ovata sessilia, foliis pedunculos fulcrantibus inferioribus similia sed majora. Calathidia interdum 1–2 («*L. sibirica* var. *alpestris* Turcz.») sed vulgo 3–15 (rarissime ad 20) in numero, in racemum laxiusculum, 2–3.5 cm longum aggregata, cum ligulis 2–3.5 cm diam., breviter pedunculata, primo suberecta dein nutantia, cauli parallela, pedunculis superioribus 2 mm longis, inferioribus 8–30 mm (rarissime ad 4–7 cm) longis, ut rachis pilis crassiusculis albidis demum brunnescentibus et interdum albis araneosis sparse tectis; folia pedunculos fulcrantia ovata, cymbiformia, purpurea. Involucrum basi foliis fulcrantibus binis filiformibus vel lanceolato-linearibus praeditum, cylindraceum vel anguste campanulatum, indistincte biseriale, phyllis 7–8 glabris apice tantum pubescentibus 8–11 mm longis, plus minusve purpureo coloratis, biformibus, internis lanceolato-ovatis, margine late membranaceis, breviter acutatis, externis multo angustioribus, linearibus vel lanceolato-linearibus, tenuiter longeque acuminatis, haud membranaceis. Flores marginales, 6–7, ligulis oblongis, 11–15 mm longis, 3–4 mm latis, tubo 4.5–6 mm longo; flores disci 15–20, corolla 7–9.5 mm longa, parte apicali dilatata, breviuscule campanulata, parte basali tubulosae subaequilonga; antherae basi breviter sagittatae, appendice apicali longiuscula; antheropodium elongatum. Styli rami tenues, appendice leviter dilatata, extus ad basin pilis brevibus conicis obsiti. Achenia pallida, 5–6 mm longa, pappo rufescenti, achenio paulo longiore.

Habitat: in pratis paludosis salsuginosisque, in vallibus fluminum, in paludibus herbosis in regionibus silvatica, stepposa alpinaque. Sibiriae occidentalis orientalisque, Mongoliae borealis, nec non Orientis extremi.

Typus: Transbaicalia occidentalis in districtu lacuum Eravinskije prope pag. Constantinovka, in salebris silvae, 3 VII 1912, fl., M.

Korotki, Z. Lebedeva et M. Okuschko, n° 263. Typus et isotypus in Herb. Inst. Bot. Acad. Sc. URSS in Leningrad conservantur.

A f f i n i t a s: A *L. arctica* Pojark. foliis angustioribus, sagittatis (non cordatis vel triangulari-cordatis), lobis basalibus longioribus, petiolo longiore, lamina 2.5–5-plo (nec 1.5–2 rarius 3-plo) longiore nec non florum radii ligulis latioribus differt.

66. *L. arctica* Pojark.—*L. sibirica* var. *minor* Nym. Consp. fl. Europ. (1879) 350.

Rhizoma speciei praecedentis; caulis 15–70 cm altus, tenuis 1.5–3 mm crassus, fere efoliatus, saepissime violaceo-purpureus, raro in parte media viridis, sub inflorescentia solum pilis crassiusculis brunnescentibus obsitus. Folia in sicco tenuia, sed nonnunquam sat rigidiuscula, supra saturate, subtus laete viridia; folia radicalia saepe 2, (1.7)2–7(11) cm longa, 2.2–7(10) mm lata, cordata, triangulari-cordata vel cordato-sagittata, apice obtusa vel breviter acutata, lobis
892 basalibus divergentibus obtusis vel breviuscule acuminatis, margine irregulariter dentata, dentibus latis triangularibus in mucronum brevem contractis, nonnunquam indistincte remote dentata petiolis tenuibus, lamina 1.5–2(3) plo brevioribus; folia caulina 2, inferus radicalibus conforme, sed petiolo brevior et longius vaginato; superus longe remotum, lamina parvula, petiolo in vaginam amplam amplexicaulem transformato; folia apicalia saepe nulla, rarius unicum squamiforme, sessile, lanceolatum, foliis floralibus conforme, sed majus. Inflorescentia simplex racemosa laxa e calathidiis 2–7(12) composita; pedunculi pilis crassiusculis fusciscentibus obsiti, inferiores 12–35(50) mm longi, superiores 6–10 m longi; folia pedunculos fulcrantia fusco-purpurea, lanceolata, infima interdum ovata, longe acuminata, integerrima, pedunculum cum involucrio amplectentia, superiora plana, non raro linearia. Calathidia cum ligulis 2–3 cm diam., post anthesin nutantia; involucrum basi foliis fulcrantibus binis linearibus instructum, cylindraceum vel cylindraceo-campanulatum, plicis 6–8(9), glabris, totis vel partim, purpureis, 6–10(12) mm longis, biformibus, internis lanceolatis vel subovatis late membranaceo marginatis, externis angustioribus margine haud membranaceis. Flores radii 5–6(7), ligulis linearibus vel oblongis, 8–10 mm longis, 1.25–4 mm latis, 3–6-nerviis, tubo 3–4 mm longo; flores disci 17–26, corolla 7–8 mm longa, parte superiore campanulata vel late campanulata, 3–3.5 mm longa, in tubum tenuem subaequilongum subito contracta; filamenta et styli ramuli speciei praecedentis. Achenia anguste cylindracea, 5–6.5 mm longa, pappo albido-fuscescenti eis sublongiore.

H a b i t a t: in pratis paludosis, in paludibus herbosis, ad ripas humidas lapidosasque nec non in tundris fruticosis et silvarum pratulis

in Rossiae europaeae regionibus arctica et subarctica, in jugo Ural et in parte boreali-occidentali Sibiriae occidentalis.

T y p u s: Rossia septentrionalis: peninsula Kanin, in declivi boreali jugi Pae-hoi, in saliceto vallis lapidosae, 26 VII 1928, fl. V.N. Andrejev, n° 525.

A f f i n i t a s: Cfr. supra

67. Sectio **Stenostegia** Pojark. sect. nova.—Folia pedunculos fulcrantia angusta, parva, linearia vel subulata, inferiora pedunculos multo breviora. Antheropodium filamento paulo latius. Stigmatis striae latae, prominulae, usque ad appendicem extensae. Pappi pili albi, molles. Folia viridia (nec glauca) textura molli (non carnosa, nec subcoriacea).

Typus sectionis—*L. narynensis* (Winkl.) O. et B. Fedtsch.

Species Asiae praecipue mediae centralisque propriae, paucae Orientis extremi incolae.

68. Subsectio **Oligocephalae** Pojark. subsect. nova.—Calathidia magna aut mediocria, solitaria vel 2–10 in numero, in inflorescentiam racemosam aggregata. Involucrum cupuliforme. Rhizoma tomento dense vestitum. Folia radicalia ovatovel orbiculato-cordata, rarius subreniformia.

Typus subsectionis: *L. narynensis* (Winkl.) O. et B. Fedtsch.

Species Asiae mediae incolae.

893 69. Subsectio **Racemiferae** Pojark. subsect. nova.—Calathidia mediocria (4.45 mm diam.), numerosa, in racemum longum angustum aggregata. Involucrum campanulatum. Folia radicalia reniformi-triangularia vel triangulari ovata Rhizoma nudum.

Typus subsectionis—*L. jaluensis* Kom.

Area geographica subsectionis—Korea et regio Ussuriensis.

70. Subsectio **Paniculatae** Pojark. subsect. nova.—Calathidia parva, plerumque paniculatim aggregata. Rhizoma tomento denso vestitum.

Typus subsectionis—*L. thyrsoides* (Ldb.) DC.

Species Asiae mediae centralisque nec non Sibiriae austro-occidentalis incolae.

71. Series **Thyrsoideae** Pojark. ser. nova.—Involucrum apertum campanulatum vel cupuliforme. Paniculae rami laterales etiam inferiores rachide breviores, calathidia racemosim aggregata ferentia. Folia oblongo-ovata, basi cordata vel sagittata.

Typus seriei—*L. thyrsoides* (Ldb.) DC.

Series monotypica.

72. Series **Songaricae** Pojark. ser. nova.—Involucrum angustum cylindraceum vel obconicum. Calathidia in paniculam pyramidatam vel corymbosam (inflorescentiis partialibus racemosis) aut in racemum aggregata. Folia oblongo-triangularia, acuta, basi cordata.

Typus seriei—*L. songarica* (Fisch.) Ling.

Species duae Asiae mediae incolae.

73. Series **Thomsonianae** Pojark. ser. nova.—Involucrum anguste cylindraceum vel obconicum, aureo-fuscum. Inflorescentia generalis paniculato-corymbosa, inflorescentiis partialibus corymbosis ad apicem ramorum lateralium dispositis. Folia orbiculari-ovata usque ad reniformi-triangularia, texturamolli supra atriviridia.

Typus seriei—*L. Thomsonii* (Clarke) Pojark.

Species duae Asiae mediae, Afghanistaniae nec non Himalayae occidentalis incolae.

74. Series **Altissimae** Pojark. ser. nova.—Involucrum tubuloso-campanulatum. Inflorescentia generalis paniculato-pyramidata, inflorescentiis ramorum lateralium racemosis subpaniculatisve apicalibus. Folia laete viridia, crassiuscula.

Typus seriei—*L. altissima* Pojark.

Series monotypica.

75. Sectio **Senecillis** (Gaertn.) Pojark. sectio nova.—*Senecillis* Gaertn. De fruct. et sem. II (1791) 453.—*Senecio* groupe *Ligularia* B.
894 *Euligularia* 1. *Racemosi* Franch. in Bull. soc. bot. Fr. 39 (1892) 189, p. p.—*Cyathocephalum* Nakai in Tokyo Bot. Mag. XXIX (1915) II.—*Ligularia* sect. *Cyathocephalum* Kitam. l. c. 185.—descript. emend.

Calathidia plerumque parva, rarius mediocria in racemum simplicem vel in paniculam elongatam angustam aggregata. Involucrum tubulosum aut fere cupuliforme, phyllis liberis aut in cyathium apice 3–4 dentatum connatis. Pappi setae albae vel fuscrescentes, molles vel rigiusculae longae vel breviusculae brevissimaeque. Antheropodium filamento distincte latius. Styli rami appendice conica aucti. Folia laeta glauca, crassiuscula, succosa vel subcoriacea.

Typus sectionis—*L. glauca* (L.) O. Hoffm.

Species huius sectionis in Asia orientali, media, centralique, Irania, Sibiria et Europa distributa sunt.

76. Subsect. **Sericochaete** Pojark. subsect. nova.—Pappi setae albae, molles, longae. Involucri phylla inter se libera. Caules fistulosi. Rhizoma glabrum.

Typus subsectionis—*L. macrophylla* (Ldb.) DC.

Species Asiae mediae, Chinae centralis nec non Iraniae incolae.

77. Subsect. **Stereochaetae** Pojark. subsect. nova.—Involucri phylla libera vel in cyathium 3–4-dentatum connata. Pappi setae fuscae rigidiusculae, floribus disci breviores. Calathidia in paniculam oblongam densam aggregata. Caules solidi. Rhizoma pilis flexuosis vestitum.

Typus seriei—*L. mongolica* (Turcz.) DC.

Species Orientis extremi incolae.

78. Series **Mongolicae** Pojark. ser. nova.—Involucri phylla libera. Pappi setae 3–7 mm longae.

Typus seriei—*L. mongolica* (Turcz.) DC.

Species tres in regione Amurensi, in China boreali-orientali nec non in Korea (insula Quelpart inclusa) distributa.

79. Subsectio **Senecillis** (Gaerth.) Pojark. subsect. nova.—*Senecillis* Gaertn. De fruct. et sem. II (1791) 453, tab. 173, p. p. typica.—Calathidia in inflorescentiam racemosam densam. aggregata (pedunculis inferioribus nonnunquam calathidia 2–3 ferentibus). Involucrum apertum, late campanulatum vel cupuliforme, phyllis 7–12. Pappi setae brevissimae, 0.5–2 mm longae, rigidiusculae, aculeato-barbellatae. Caules fistulosi.

Typus subsectionis—*L. glauca* (L.) O. Hoffm.

Species duae Sibiriae austro-occidentalis nec non Podoliae et Transsilvaniae propriae.

80. Sectio **Glossophyllum** Pojark. sect. nova.

Calathidia mediocria, 1–3 in numero. Involucrum campanulato-cupuliforme, manifeste biseriale, phyllis distincte biformibus. Folia 895 pedunculos fulcrantia parva, viridia, lanceolata. Antheropodium incrassatum, filamento conspicue latius. Styli rami appendice conica instructi, facie superiore stigmatis striis marginalibus latiusculis, elevatis, pagina inferiore sub appendicis basi barbellata. Folia radicalia elongata in petiolum angustata, integerrima vel indistincte remote dentata.

Typus sectionis—*L. Pavlovii* (Lipsch.) Cretz.

Sectio monotypica montium Kara-tau Asiae mediae incola.

81. Subgenus **Dolichorrhiza** Pojark. subgen. nov.

Rhizoma tenue, lignescens, repens, radicibus tenuibus. Calathidia magna solitaria vel 2–6 in numero. Involucrum apertum cupuliforme, indistincte biseriale, phyllis (7)9–22, plus minusve manifeste biformibus, internis latioribus anguste membranaceo marginatis exterioribus (interiorum margines tegentibus) angustioribus margine haud vel vix membranaceis. Antheropodium latum incrassatum. Styli rami appendice semiconico praediti, facie superiore stigmatis striis marginalibus prominulis, facie inferiore sub appendicis basi barbellata. Folia reniformia.

Typus subgeneris—*L. renifolia* (C.A.M.) DC.

Species tres Caucaso endemicae.

CALENDULA L.

82. **C. karakalensis** Vass. sp. nova.

Planta annus dense glandulosula caule a basi ramoso, foliis integerremis acutis oblongis, foliis inferioribus petiolatis foliis summis sessilibus. Calathidia parva; involucri phylla uniseriaria oblonga acuta. Flosculi radiales lutei involucri 1–1½-plo longiores. Achaenia externa falcata 15–20 mm lg. late lanceolata, dorso obsita seriebus longitudinalibus aculeolorum setaciiformum in vallecula duobus lateralibus margine setaceo-denticulatis alis formata; margine ventrali achaenia alata irregulariter denticulata. Achaenia media cymbiformia cum alis membranaceis interius involutis, dorso aculeolato-setacea circumscriptione late ovata vel elliptico-rotundata, achaeniis externis duplo breviora. Achaenia interna annularia exalata dorso aculeolato-setacea apice cum excrescentia membranacea unilateralia.

Habitat: in declivibus argillosis jugi Kopet-dagh occidentalis.

Typus: Turcomania, distr. Karakalensis ad merid. a vic. Kara-Kala, in declivibus argillosis, 27 VI 1934, n° 266. A. Borissova.

Affinitas: A proxima *C. arvensis* L. achaeniis externis alatis circumscriptione lanceolatis (nec cylindricis) differt.

nominum specierum atque synonymorum plantarum
in tomo XXVI Florae URSS commemoratarum

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